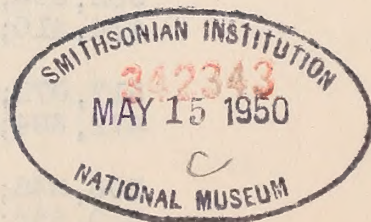


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H. D. Patterson
VOLUME II
GRAPHOPHONE PATENTS
460,123 - 576,081

<u>A.</u>	Amet, E.H.,	No. 521,456;
	"	539,212;
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	"	562,693;
	"	562,694;
	"	562,753;
	"	573,071;
	Andrews, A.D.,	515,811;
	Anthony, M.O.,	489,519;
	Atkins, J.L.,	495,869;
<u>B.</u>	Barnet, W.S.,	502,246;
	Berliner, E.,	534,543;
	"	548,623;
	"	564,586;
	Bettini, G.,	488,379;
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	Broich, J.,	532,718;
	Bruening, W.,	462,687;
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<u>C.</u>	Capps, F.L.,	570,378;
	Church, F.S.,	529,019;
	Clark, L.S.,	474,946;
	Criswell, F.M. & J.A.E.,	470,477;
<u>D.</u>	Douglass, D.F.,	475,490;
<u>E.</u>	Edison, T.A.,	460,123;
	"	465,972;
	"	484,582;
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	"	484,585;
	"	488,189;
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	"	488,191;
	"	496,191;
	"	499,879;
	"	500,280;
	"	500,281;
	"	500,282;
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	"	541,923;
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	"	575,151;
	Emerson, V.H.,	567,738;
<u>F.</u>	Ferguson, A.C.,	539,254;
	Flora, E.E.,	494,778;
	"	494,807;

<u>G.</u>	Gilliland & Toppan, Glass, L., " " Gray, L.B.,	No. 518,209; 535,445; 539,806; 529,904;
<u>H.</u>	Henderson, W.G., Herrington, G.H., Holtz, H.T., " " Hoeschen, H., " "	493,719; 464,476; 463,989; 463,990; 488,278; 524,761;
<u>I.</u>		
<u>J.</u>		
<u>K.</u>	Keller, A.K., " " " " Kinney, F.S., " "	518,190; 518,191; 518,192; 538,262; 538,263;
<u>L.</u>	Lahola, V., Ling, J.H., Lioret, H.J.,	479,431; 495,557; 528,273;
<u>M.</u>	Macdonald, T.H., " " " " " " Mackintosh, J.W., Madgen, W.L., Moore, G.W., McKelvey, S.D., " "	523,748; 527,755; 559,806; 569,290; 503,610; 490,450; 568,116; 519,614; 531,690;
<u>N.</u>		
<u>O.</u>	Ott, J.F.,	466,922;
<u>P.</u>		
<u>Q.</u>		
<u>R.</u>	Randall, C.A., " " Robinson, L.S., Rosenthal & Frank,	502,382; 502,383; 562,664; 474,410;
<u>S.</u>	Sanborn, H.L., Skillin, J.L.,	517,072; 472,684;
<u>T.</u>	Tainter, C.S., " " Tewksbury, G.E.,	506,348; 510,656; 523,556;



U.

V.

<u>W.</u>	Waldron, G.T.,	No.	524,921;
	Wassenich, J.E.,		505,910;
	"		532,851;
	White, J.H.,		467,530;
	"		504,380;
	Wilson, E.L.,		472,417;
	"		489,666;

X.

Y.

Z.

(No Model.)

T. A. EDISON.
PHONOGRAM BLANK CARRIER.

No. 460,123.

Patented Sept. 29, 1891.

Fig. 2,

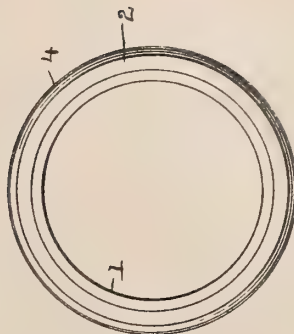
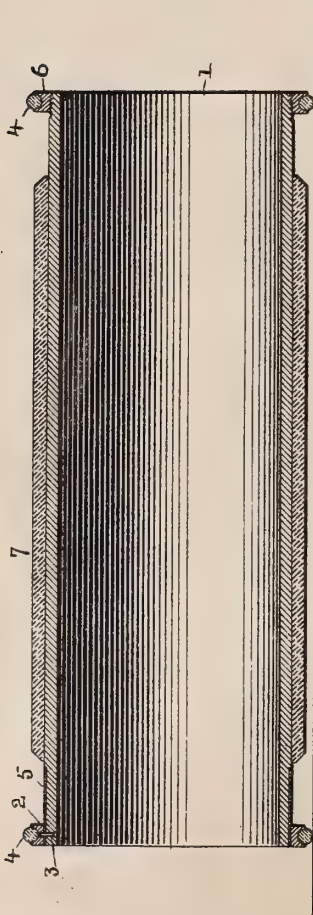


Fig. 1,



Witnesses
Geo. W. Breech.
Edward Thorpe.

Inventor
T. A. Edison,
By his Attorneys
Sydney S. Sully.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK CARRIER.

SPECIFICATION forming part of Letters Patent No. 460,123, dated September 29, 1891.

Application filed November 21, 1890. Serial No. 372,231. (No model.)

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonogram-Blank Carriers, (Case No. 899,) of which the following is a specification.

My invention relates to devices for supporting and protecting phonogram-blanks or recording-surfaces on which a phonographic record has been or is to be recorded.

Phonogram-blanks are ordinarily made of wax or wax-like material, and this material is easily nicked or scratched by contact with rough or hard surfaces and is abraded by being rubbed against other surfaces, and such treatment so roughens the surface as to render it impossible to make a perfect record, or, if the record has already been made, to injure it. The object of this invention is to produce a carrier for the blanks which shall obviate or largely reduce the difficulty above indicated.

In the accompanying drawings, which illustrate the invention, Figure 1 is a longitudinal section through a carrier and the phonogram-blank thereon, and Fig. 2 is an end view of a carrier made in accordance with this invention.

1 is a cylinder of hard rubber or other material which is sufficiently rigid to stand the blows and strains to which it may be subjected and which is otherwise suitable for the purpose. The inner bore of the tube is made slightly tapering and of the proper size to fit the phonograph-cylinder with which it is intended to be used. When the phonogram-blank is to be used, it is not removed from the carrier, but the carrier itself is slipped onto the phonograph-cylinder. It is preferable to have the carrier somewhat longer than the blank, in order that the flanges will be so far removed from the ends of the blank that no part of the recorder or reproducer or the carrying devices therefor will touch the flanges as they approach the end of the blank. At each end of the cylinder is a flange. At the left in Fig. 1 the flange 2 is formed by a ring slipped onto the end of the tube and

held in place by rivets or similar devices 3. Said ring is grooved around its periphery, and in the groove is held a soft rubber or other soft and elastic tire or ring 4. Around the end of the tube, under the ring 2 and preferably flush with the surface of the tube, is a strengthening-band 5. At the opposite end of the tube 1 the flange is formed by a screw-threaded ring 6, which fits on a screw-threaded portion of the tube. This ring is also grooved around its periphery and is provided with an elastic tire 4. This ring being removable, allows the blank to be slipped onto the carrier, after which the ring is put in place. 7 is the phonogram-blank in place on the carrier above described. It will be seen that the flanges at the end of the carrier, or at least the elastic tires 4, project from the surface of the carrier to a greater distance than the phonogram-blank, so that when the blank and carrier are laid upon a flat surface the blank will be entirely out of contact therewith, and that all wear caused by rolling or moving the blank around will be taken up by the carrier. It will be evident that it is not essential that the elastic tire 4 be used in just the form described. The same purpose would be served by elastic bearing-blocks at intervals around the flange. So, too, it is not essential that one of the flanges be permanently secured to the carrier as described, since both may be screw-threaded.

Having thus described the invention, what I claim is—

1. A phonogram-blank carrier consisting of a tube adapted to fit a phonograph-cylinder and having a flange at each end, substantially as described.

2. A phonogram-blank carrier consisting of a tube adapted to fit a phonograph-cylinder and having a flange at each end, one flange being removable, whereby a blank can be placed on or removed from the carrier, substantially as described.

3. A phonogram-blank carrier consisting of a tube adapted to fit a phonograph-cylinder and having a flange at each end, one flange being screw-threaded and fitting a screw-thread on the carrier, substantially as described.

4. A phonogram-blank carrier consisting of a tube adapted to fit a phonograph-cylinder and having a flange at each end, and elastic bearings on said flanges, substantially as described.

5 5. A phonogram-blank carrier consisting of a tube of rubber or other suitable material, a strengthening-ring at one end, a ring serving as a flange on the same end of the tube, and a flange at the opposite end, substantially as described.

10 6. The combination, with a phonogram-blank carrier having flanges at each end, of a phonogram-blank between the flanges and

of less thickness than the flanges, substantially as described. 15

7. A phonogram-blank carrier consisting of a tube of rubber or other suitable material, and a flange or flanges mounted on the carrier and having elastic bearing-surfaces, whereby a blank supported on the carrier will be protected, substantially as described. 20

This specification signed and witnessed this 17th day of November, 1890.

THOS. A. EDISON.

Witnesses:

HARRY F. MILLER,
THOMAS MAGUIRE.

(Specimens.)

I. W. HEYSINGER.
PHONOGRAPH TABLET.

No. 460,338.

Patented Sept. 29, 1891.

Fig. 1

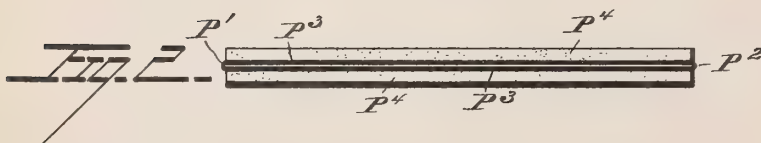
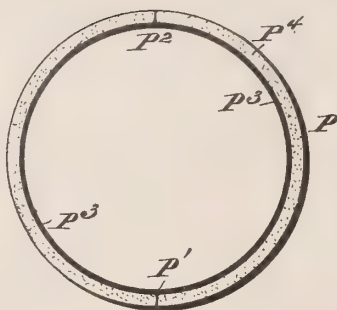


Fig. 3

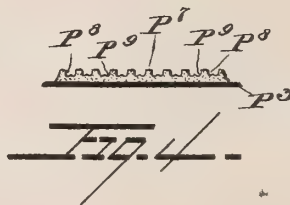
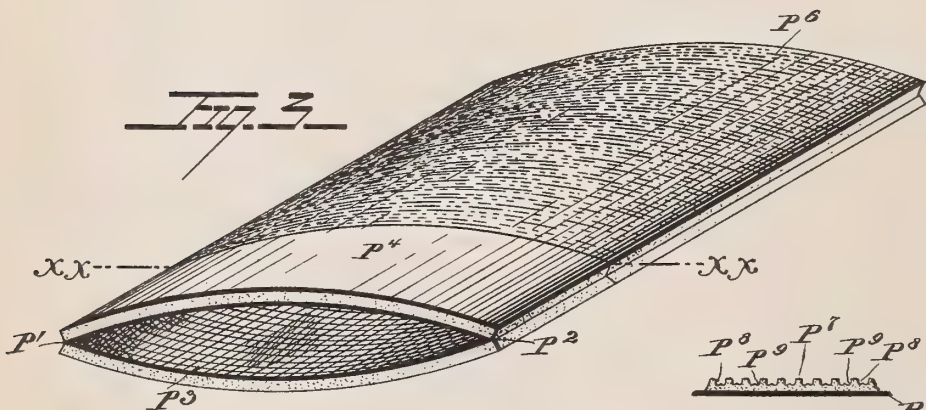
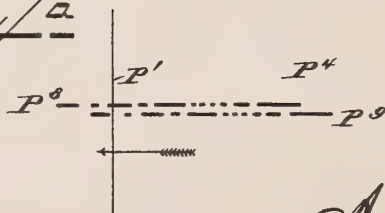


Fig. 4a



WITNESSES:

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INVENTOR

Isaac W. Heysinger.

UNITED STATES PATENT OFFICE.

ISAAC W. HEYSINGER, OF PHILADELPHIA, PENNSYLVANIA.

PHONOGRAPH-TABLET.

SPECIFICATION forming part of Letters Patent No. 460,338, dated September 29, 1891.

Original application filed February 7, 1888, Serial No. 263,282. Divided and this application filed April 17, 1883. Serial No. 270,897. (No model.)

To all whom it may concern:

Be it known that I, ISAAC W. HEYSINGER, of Philadelphia, in the county of Philadelphia, and State of Pennsylvania, have invented a certain new and useful Improvement in Sound Recording and Reproducing Tablets for Phonographs, of which the following is a full, clear, and exact description, reference being had to the drawings accompanying and forming part of this specification, in which—

Figure 1 is a view in cross-section of the collapsible tablet expanded into a cylinder, as when placed upon the cylinder of a phonograph for use. Fig. 2 is a like view of the same flattened down or collapsed for mailing purposes or permanent preservation. Fig. 3 is a perspective view of a like tablet collapsed, but not quite flattened, and having its surface partly written over in the phonograph, and also shows the transverse line upon which the surplus may be cut off for subsequent use and to lighten the tablet for mailing or other purposes. Fig. 4 is a sectional view taken upon one side of the tablet and in which the section is across the lines and grooves formed by the stylus of the phonograph, and Fig. 4^a a top view of the grooves P⁸ and P⁹.

The lettering in all the figures is uniform.

The subject-matter of my present application originally formed a part of my application for Letters Patent, Serial No. 263,282, filed February 7, 1888, and has been divided therefrom to include the tablet in a separate patent. The said original application comprised a working phonograph with which the tablets which form the subject-matter of this divisional application were adapted to be used, and reference is made to that application to show such manner of use, though the tablets herein shown, described, and claimed are adapted to be used with any suitable phonograph, and are not limited to the specific devices shown and described in said original application; and the said sound recording and reproducing tablets, surfaced as herein described and claimed, are not limited in my invention to the specific form shown, with reference to the machine described in my originally-filed application, but are applicable to machines using tablets of other form, and my tablets may be constructed in other

shapes than those herein specifically shown without departing from the principles and scope of my invention.

My invention relates to the construction of a phonograph-tablet, or "phonogram," as it is sometimes called, upon which the stylus of a phonograph traces an indented, waved, or other inscribed record adapted to be subsequently reproduced in articulate speech by a reproducing-phonograph, in which I make my tablet in a cylindrical form having a flexible foundation of paper, cloth, or other suitable substance, upon which the plastic recording-surface is made by the application of a suitable composition, adherent thereto and having a surface adapted to be indented or inscribed by the stylus of a phonograph. Along the two opposite sides of this cylinder from end to end I cut through the composition down to the foundation, making a narrow slit along each side. When placed upon the cylinder of a phonograph for use, these slits are closed and the tablet forms a complete cylinder; but when removed from the machine the sides may be collapsed upon the foundation along the slitted lines, and the tablet becomes flat, having a double thickness and hinged joints at the sides and capable of being again erected into a cylinder at any time to be put into a similar machine for subsequent use to reproduce the sounds the record of which it may bear or to receive such record in case it has not been previously written upon. It is in its collapsed or flattened form very suitable for sending through the mails, and may be put, like a letter-sheet, into an ordinary envelope, and, if the surface be such as I prefer to use, and which will be hereinafter described, it will bear any amount of hard usage without injury. These collapsed tablets also occupy very little space and may be tied up or packed in bundles, like postal-cards, for transportation, sale, use, or preservation after having received an inscribed record. I do not always make these tubular or cylindrical tablets with a single slit or cleft down each side; but more than two slits may be cut and more than two hinged joints may be used, if so desired. The plastic composition must of course be sufficiently flexible to permit the sides to

be collapsed or flattened, or nearly flattened, though with an elastic surface of hard material the flattening may not be complete, but is made so by tying in bundles, inclosing in envelopes, or compression in other ways, after the cylinder has been collapsed. In certain cases these slits may not extend entirely down to the foundation, and in other cases they may extend partly through the foundation, while sometimes strips of flexible material may be glued or otherwise attached to the inside surfaces at the joints to form the hinges, or the whole tube may be made collapsible at any part. In manufacturing these tubular tablets I make them in long lengths and prefer to use a material woven or knitted into tubular form, which, stretched upon a flat former with parallel sides, or, preferably, upon a cylindrical mandrel, I paint or coat over with my plastic composition until a requisite thickness of surface has been secured, which may be about the one-twentieth of an inch, using the composition hot and in a fluid or semi-fluid state. When cooled and hardened, I run a graduated slit down each side and cut through the composition to the desired depth. The long tube then removed from the mandrel, I cut it into suitable lengths for use, and, as shown in my former application of February 7, 1888, with the machine therein described and claimed, I prefer to cut these lengths longer than the cylinder of the machine, so that the tablet applied thereto may project from the free end of the cylinder thereof. When a portion has been inscribed by the stylus of the machine, the remainder may be clipped off with a pair of scissors, when flattened, and used again until the whole has been written over without waste.

My invention also relates to the composition of the plastic surface of a phonograph-tablet; and it consists in using a material or composition therefor which, when used in the machine for receiving a record, will be soft and plastic, but which said composition, after receiving the said record, is rendered hard and resistant, so that the record once made may be reproduced indefinitely under the stylus of a reproducing-phonograph without abrasion or injury to the record, and also that these tablets, bearing their records, may be piled up in bundles, sent through the mails, and subjected to rough usage without crushing down the record or impairing its use for reproducing the sounds of the same.

Referring to the drawings, in Figure 1 I have shown in transverse section a tubular foundation of flexible material P^3 , formed from a woven tube or by pasting together the edges of a strip of paper, muslin, or like substance. A suitable paste or glue for this purpose is made of fish-glue, with boiling water, the joint treated with a solution of bichromate of potassa afterward, (which renders the glue insoluble,) and then washed, if desired. This joint is both flexible and insoluble. Upon the outer surface of this tubu-

lar and flexible foundation P^3 is applied the plastic composition P^4 to the requisite thickness, the outer surface being smooth and even. It may be made so in a lathe, if desired, before removal from the cylindrical mandrel upon which the tube P^3 is fitted; but for use in the machine which forms the subject of my application of February 7, 1888, no special accuracy of surface is required, as the plow-point therein described will cut to a definite distance from the foundation of the cylinder, irrespective of variation of the surface, and the record produced at the bottom of such grooves will be regular under the same circumstances.

The composition which I prefer to use and which forms a part of this invention is made by mixing gutta-percha with resin and melting the same together with or without the addition of other fusible or miscible substances to render the composition more or less soft and plastic when cold or when warmed for use in the machine. Gutta-percha and resin melted together in equal parts, the proportion varying with differences inherent in different samples, make a composition hard and elastic at ordinary temperatures, but soft, plastic, and inelastic at a temperature of from 110° to 140° Fahrenheit, and will answer the purpose very well. It becomes fluid at or below the boiling-point of water and can be readily applied with a brush or otherwise to the foundation P^3 repeatedly, if necessary, until a proper thickness is secured. This composition or a similar one so modified by like temperature I prefer to use, when I soften the plastic surface of my tablet by artificially-applied heat at the time the record is being made and allow the said surface to harden by exposure to the ordinary temperature of the atmosphere, the same being repeated as often as desired, as shown and described in my application of February 7, 1888; but I sometimes prefer to harden my composition by the action of chemicals applied to the surface thereof in solution or otherwise, and in such case I usually add more or less starch to the said composition when being prepared, and such composition is very readily rendered hard and elastic by a solution of chloride of zinc or other concentrated chlorides. Such methods of hardening substances are numerous and are well known for many purposes in the arts. I also sometimes use alcohol as a solvent instead of moist or dry heat, and in such case I increase the proportion of resin used with my gutta-percha or use a resin-soap, so that the solvent action of alcohol applied to the surface will render the same soft and plastic until the said alcohol evaporates, when the said surface will resume its normally hard and elastic condition. I also use other well-known mechanical equivalents besides the modifications enumerated above; but for cheapness, readiness of application, and convenience I prefer to use a normally hard and resistant surface, softened tempo-

rarily while being written upon by artificially-applied heat and subsequently restored to a hard and resistant condition by the coolness of the atmosphere at ordinary temperatures.

5 This softening may be accomplished by placing the tablet for a few minutes in a pail of moderately-hot water and then applying the same to the machine to receive the record made by the stylus thereof. A tablet thus
10 heated will remain soft if made of approximately equal parts of gutta-percha and resin with or without the addition of a few drops of glycerine or molasses for a period of from ten to twenty minutes; but I prefer to employ the heating device shown, described,
15 and claimed in my application for Letters Patent hereinabove mentioned, as being more under control and capable of continuous use at any time. Such a surface, when thus
20 written upon, may be subsequently used again, the former record having been expunged by passing a hot iron or the like over it and melting and smoothing down the same to form a new surface. Gutta-percha has a
25 special value as an ingredient because, while most substances expand by heat and contract by cooling, the reverse is the case with gutta-percha, so that when this substance is used and the tubular tablet placed upon the cylinder of the phonograph and heated it not
30 only becomes soft and plastic, but contracts upon the cylinder, so as to present a smooth, firm, and even surface for the stylus of the phonograph. The composition, thus applied
35 to the foundation, as shown in the figures, and allowed to harden upon a mandrel, is divided longitudinally by the clefts or slits P' P^2 , which, as shown, extend down to the foundation. These slits may be made in the composition P^4 when soft or after partially or
40 wholly hardening. The hard elastic-surfaced cylinder cut into suitable lengths when removed from the mandrel or former presents a surface resistant against injury, which may be readily collapsed upon the hinges P' P^2 ,
45 as shown in Figs. 2 and 3. As the cylinder or mandrel upon which the foundations are laid is the precise diameter of the cylinder of the phonograph, this tablet may be readily
50 sprung open and slipped over the free end of the cylinder of the machine, when the clefts P' and P^2 will be closed and the surface of the tablets present a smooth outer side. If removed from the cylinder of the machine
55 when warm, it will flatten down completely, as shown in Fig. 2; but if allowed to harden before removal it will only partially collapse, as shown in Fig. 3; but in either case it may be made flat or cylindrical at will, and may be
60 put into an ordinary envelope for mailing, like a common letter, or may be bundled up with others and stored away without the necessity of any special precaution, the composition being unaffected by water or moisture, mold, time, or accidental knocks or blows.
65 As shown in Fig. 3, these tablets, when made longer than required, may be readily cut off

upon the line $xx\ xx$ and the surplus used again. This is easily done when the tablet is collapsed by a pair of scissors or other means.

In Fig. 4 are shown the grooves P^6 , made by the stylus of the recording-phonograph, corresponding in the figure to those made by my special machine, as described in my other application aforesaid; but the grooves of the record may be of any form and made by any sort of recording-stylus, and the tubular collapsible tablet may be modified to conform to the special requirements in any case and used with phonographic recording and reproducing instruments of other form and construction than the machine specifically shown, described, and claimed in my other application—to wit, Serial No. 263,282, filed February 7, 1888—with which my tablet as shown in the
75 figures is especially adapted for use.

In certain cases, with a very flexible surface, it may not be necessary to cut the slits P' P^2 to any considerable depth, and in some cases the tablet in tubular form may be made
90 collapsible without the use of specially-inscribed clefts, the foundation being thinned at certain places, or otherwise; but I prefer the form shown and above described, as the record is not in anywise impaired by the collapsing of said tubular tablet when such slits are used, however frequently the same may be repeated.

In Fig. 4 the groove P^6 is divided at the bottom thereof into two slightly-separated
100 parallel channels P^8 P^9 , and, as shown and described in my application for Letters Patent for a phonograph aforesaid, each of these grooves at its bottom contains an indented line of sound-record produced by the diaphragm of a phonograph acting at the same time upon two parallel styluses, one slightly
105 in rear of the other, and producing an identical record in the slightly-separated sub-grooves P^8 and P^9 , but one of said records slightly in rear of the other as the said tablet rotates in the machine. A small part of such duplicate record is seen in Fig. 4^a, in which
110 P^8 is the same as P^9 , but slightly in advance, as shown by the direction of the arrow, so that one record crosses the cleft P' at a time when the other record is upon the solid surface of P^4 , and any inequality due to the cleft P' is compensated for by the parallel record, acting through a duplicate reproducing-stylus at the same
115 time and upon the same diaphragm. This duplicate record I use with the phonograph as shown, described, and claimed in my other application aforesaid; but it is not strictly necessary, the slits P' and P^2 , if properly
120 made, making a very slight difference, and, if the surface P^4 is hardened scarcely any, the blunt reproducing-stylus crossing the closed slit very readily; but the duplicate records assist in compensating for irregularity of surface generally or for variation in the substance, as was fully explained in my former application, and they are of use for other reasons, as in case of defect of the recording

or reproducing stylus of the machine or of the cylinder or working parts thereof. For use in ordinary phonographs they may be dispensed with, if desired.

5 In making my composition for the surface of my tablets other gums or resins may be used, and linseed-oil may be used as one of the ingredients, as well as caoutchouc, in lieu of gutta-percha, a large number of like equivalents being known for all such substances in the arts; and I do not specifically confine myself to the use of any single ingredient, except as enumerated in the specific claims of those which hereinafter follow.

15 Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A phonograph-tablet for the record and reproduction of sounds, consisting of two or more flexible leaves hinged together at their sides and adapted to be expanded into a cylinder to be extended over the cylinder of a phonographic machine, said leaves having surfaces adapted to receive the indentations 25 or other record of sound produced by said phonograph, the said tablet adapted to be subsequently flattened upon said hinged sides when removed from said phonograph and subsequently expanded for use upon the cylinder of a sound-reproducing phonograph, substantially as and for the purposes described.

2. As an article of manufacture, a phonograph sound recording and reproducing tablet, consisting of a flexible foundation of paper, fabric, or the like formed into a tube, and a surface of plastic substance attached thereto, said surface adapted to receive and retain the sound-produced record of a phonograph, the said tubular tablet flexible and its sides adapted to be flattened together or collapsed for mailing or other purposes without destruction of said record, substantially as herein set forth.

3. As an article of manufacture, a laterally-collapsible tubular phonograph-tablet adapted to receive a phonographic record when expanded, to be subsequently collapsed and afterward again expanded for use in a reproducing-phonograph, substantially as described.

4. In a phonograph-tablet, the combination of the flexible tubular foundation P^3 , the plastic recording-surface P^4 , and the longitudinal clefts $P' P^2$, extended through said surface P^4 down to said flexible foundation P^3 , substantially as and for the purposes herein shown and described.

5. The laterally-flexible collapsible tubular phonograph-tablet having the surface thereof longitudinally divided into two or more segments and provided with flexible hinged joints at the sides of said segments, substantially as described.

6. In a recording and reproducing tablet, a flexible foundation and a plastic surface formed into a tubular case, said surface hav-

ing clefts extended along the sides of said tube through said plastic surface, said surface adapted to have a continuous record in said plastic material extending in parallel lines around said tube and crossing the clefts thereof, said tube adapted to be collapsed or flattened, and when again expanded, as around the reproducing-cylinder of a phonograph, having said lines of record on adjacent sides of said clefts match with each other as originally produced and produce a continuous record therefrom, substantially as described.

7. The tubular phonograph-tablet having a flexible foundation and a plastic surface, the same adapted to be collapsed or flattened for mailing or other purposes, said tubular tablet made longer than the cylinder of the machine upon which it is to be used, the surplus length adapted to be cut off with a pair of scissors or the like when the same is flattened, both sides cut simultaneously, if desired, said surplus serving for subsequent use as a separate tablet till all is used, substantially as and for the purposes described.

8. A tubular collapsible tablet for phonographs, having a flexible foundation of fabric or the like and a normally hard and resistant surface of considerable thickness, said surface adapted to be softened and made plastic by heat or otherwise for use in said recording-phonograph and subsequently hardened, substantially as described.

9. A collapsible tubular phonograph-tablet adapted to be flattened for preservation in bundles for mailing or other purposes and having a surface of considerable thickness composed of a substance adapted to be made plastic for use with a recording-phonograph and to be subsequently hardened and made resistant, substantially as described.

10. A phonograph-tablet consisting of two flat yielding surfaces, the edges thereof united by flexible hinges and the whole adapted to be expanded to form a cylindrical tablet extending over the cylinder of a phonograph for use therewith, said surfaces having a composition applied thereto to receive and reproduce the record of said phonograph, and said composition acted upon by the stylus of a recording-phonograph in a soft and plastic state and subsequently hardened for use under the stylus of a reproducing-phonograph, substantially as described.

11. In combination with the resistant and elastic surface P^4 , adapted to be softened by heat and subsequently hardened, the flexible tubular foundation P^3 , attached to and supporting said surface, and the longitudinal clefts $P' P^2$, extended through said surface down to said foundation, the whole adapted to be flattened when not in use and to be expanded to form an open tube or cylinder to closely fit over the cylinder of a phonograph and to be softened to present a plastic surface for receiving the record from the stylus of said phonograph, said surface subsequently made hard and resistant for the retention or

reproduction of said record, substantially as described.

12. In a phonograph recording and reproducing tablet, the surface composed of a body of gutta-percha with or without the admixture of modifying substances, said surface adapted to be softened by artificial heat for receiving the phonographic record and subsequently made hard and elastic by the ordinary atmospheric temperature, substantially as and for the purposes described.

13. A phonograph-tablet composed of gutta-percha and resin applied in a heated and fluid or semi-fluid state to a flexible foundation and forming a body thereupon, said body and said foundation composing a recording and reproducing tablet for phonographic purposes, substantially as described.

14. A phonograph-tablet composed partially of gutta-percha, adapted to be softened by heat and hardened by cold or chemicals for preservation subsequently to receiving the phonographic record, substantially as described.

15. A recording and reproducing tablet for phonographic purposes, consisting of a surface composed of substances adapted to be made more or less plastic by temperature or the application of chemicals and made hard

and resistant subsequently to receiving the record of said phonograph by other temperature or chemicals, the whole constructed to be used for receiving the record in a soft and plastic condition and to be used for reproducing the said record in a hard and resistant condition, the said surface supported by a laterally flexible and collapsible foundation adapted to be flattened or folded together, substantially as described.

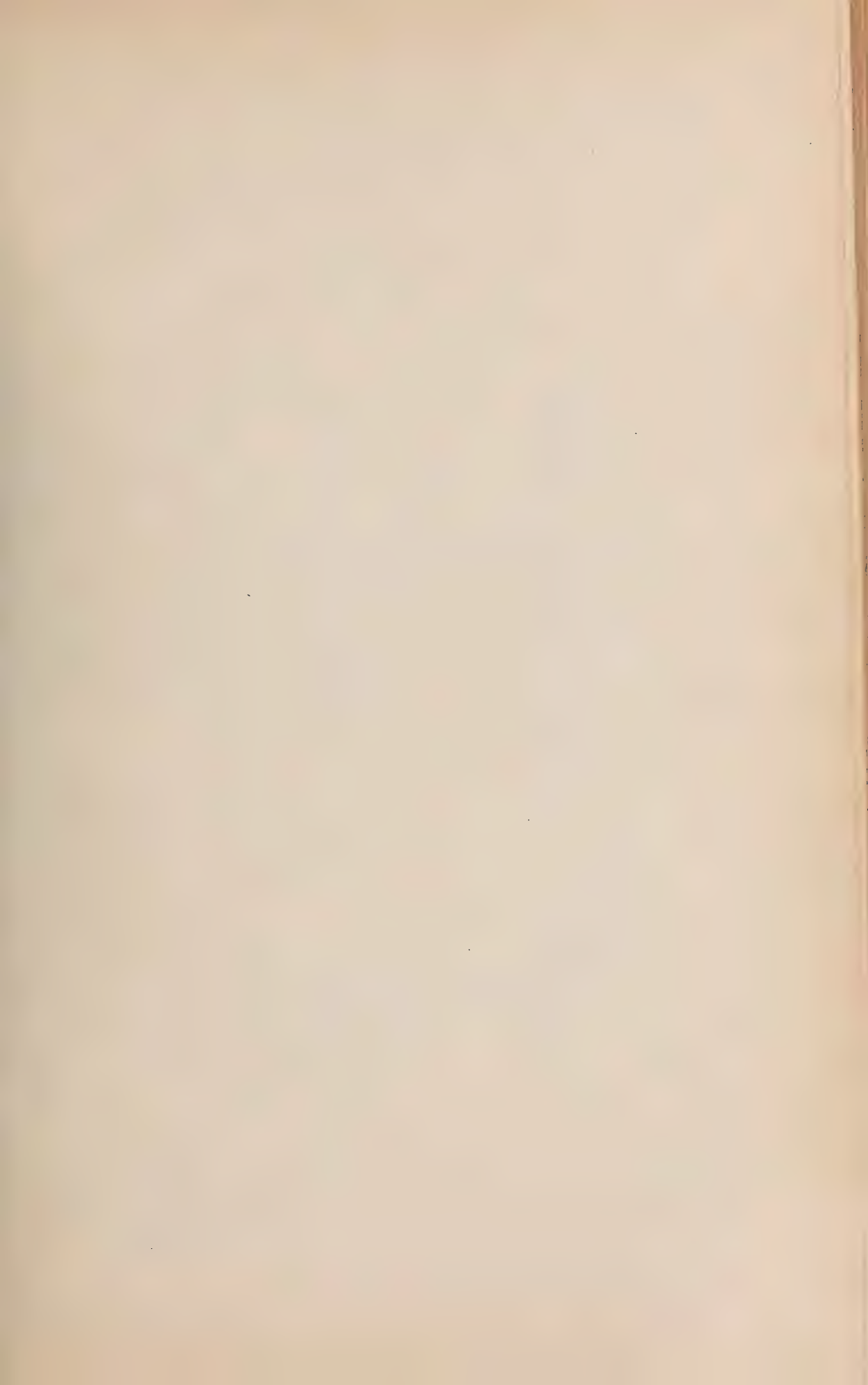
16. As an article of manufacture, a collapsible flexible tubular phonograph-tablet having a surface of considerable thickness to receive and retain the record made by the stylus of a phonograph or the like, said surface composed of a material softened by a moderate heat artificially applied thereto and subsequently hardened by the cooling effect of an ordinary atmospheric temperature, said tubular tablet adapted to be expanded for use upon the cylinder of a phonograph and at other times preserved in a collapsed or flattened state, substantially as described.

ISAAC W. HEYSINGER.

Witnesses:

J. L. HEYSINGER,

M. B. FENNINGER.



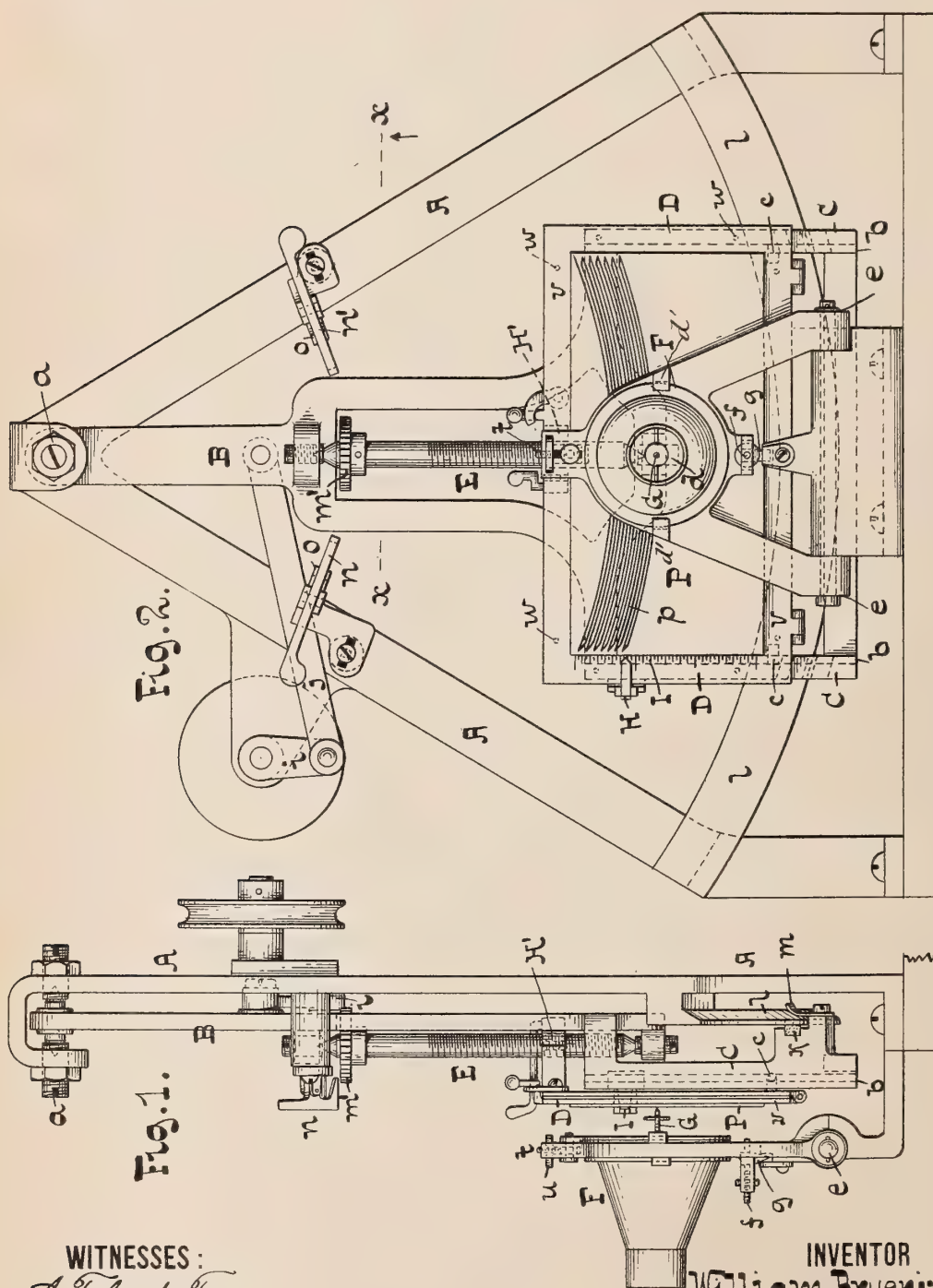
(No Model.)

4 Sheets—Sheet 1.

W. BRUENING.
PHONOGRAPH.

No. 462,687.

Patented Nov. 10, 1891.



WITNESSES:
A. Faber du Faur
T. Vohr

INVENTOR
William Bruening
BY *A. Faber du Faur*
his ATTORNEY

(No Model.)

4 Sheets—Sheet 2.

W. BRUENING.
PHONOGRAPH.

No. 462,687.

Patented Nov. 10, 1891.

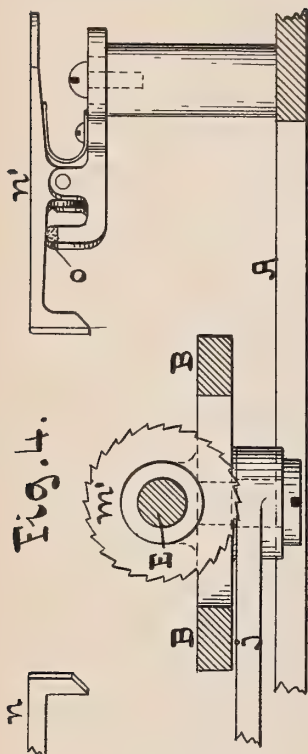


Fig. 4.

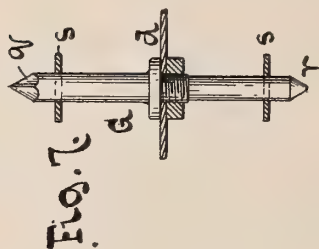


Fig. 7.

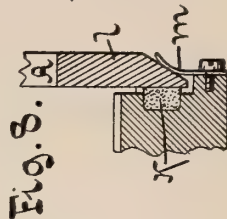


Fig. 8.

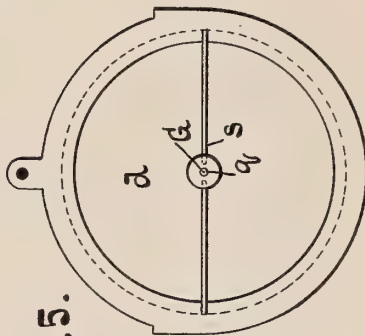


Fig. 5.

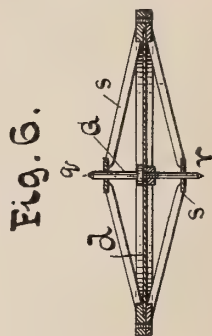


Fig. 6.

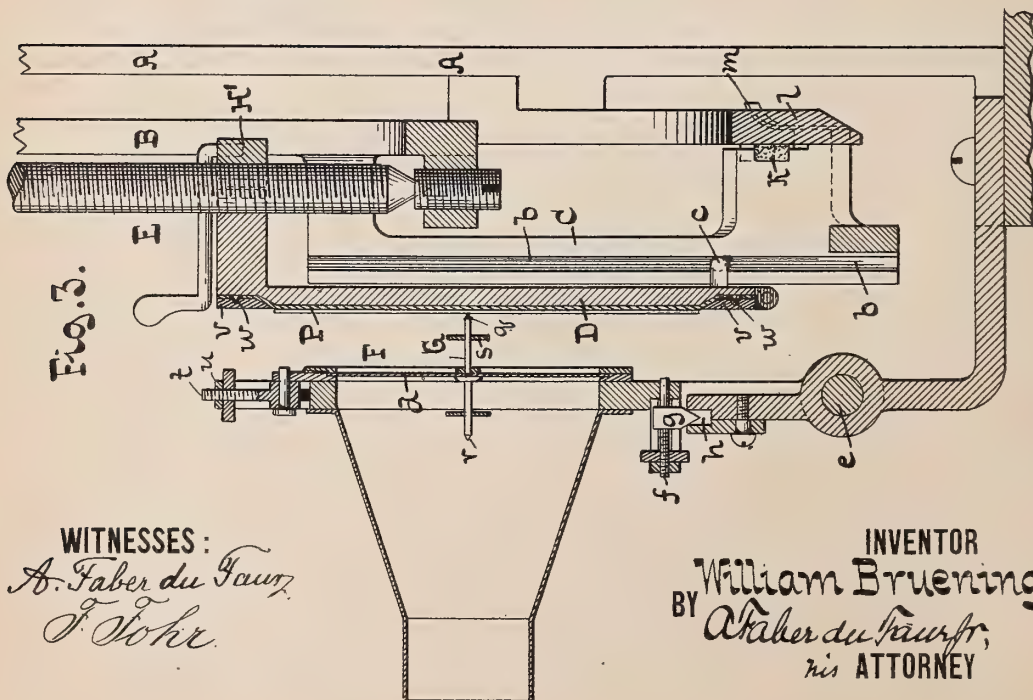
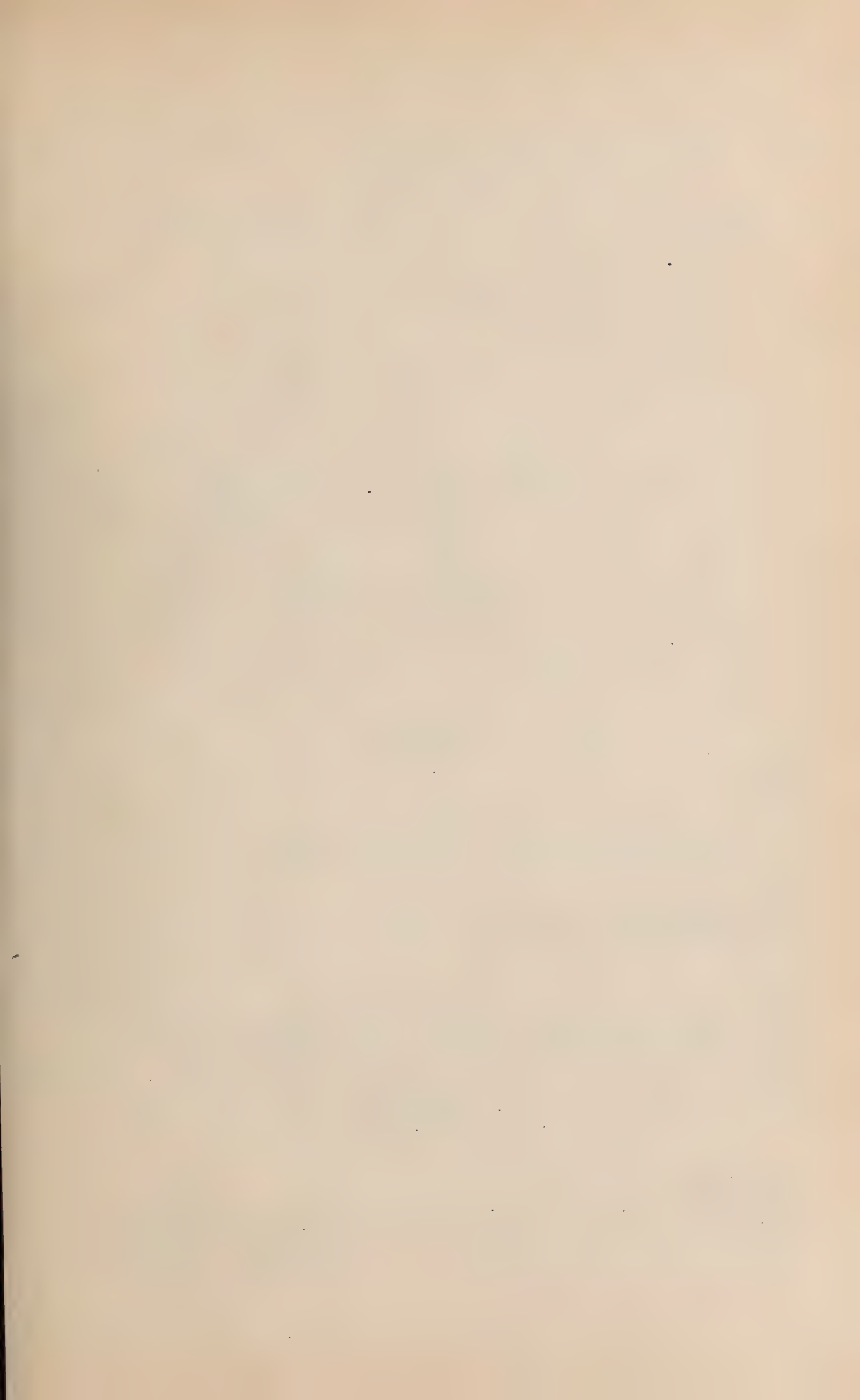


Fig. 3.

WITNESSES:
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(No Model.)

4 Sheets—Sheet 3.

W. BRUENING.
PHONOGRAPH.

No. 462,687.

Patented Nov. 10, 1891.

Fig. 9.

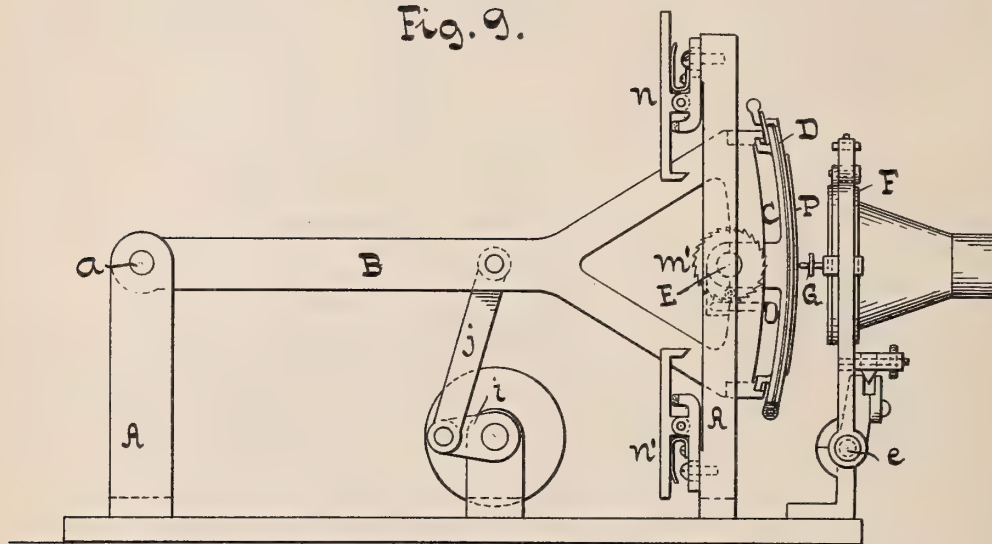
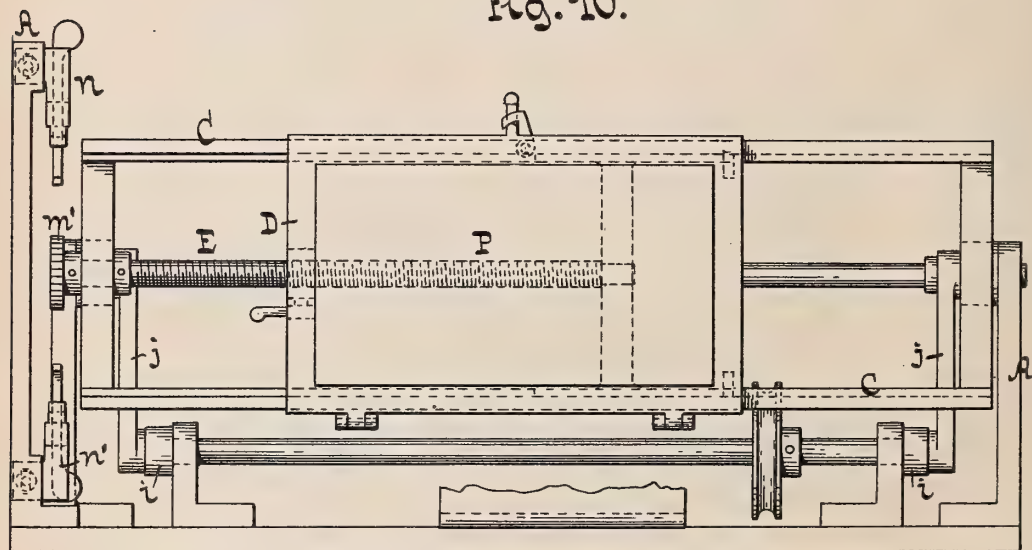


Fig. 10.



WITNESSES:

A. Faber du Faur
F. Fohr

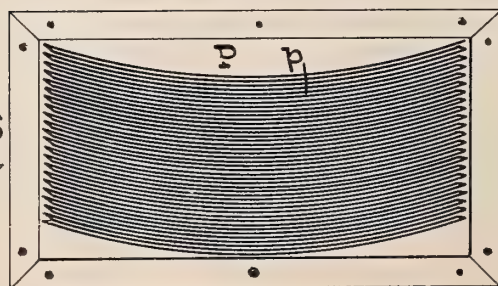
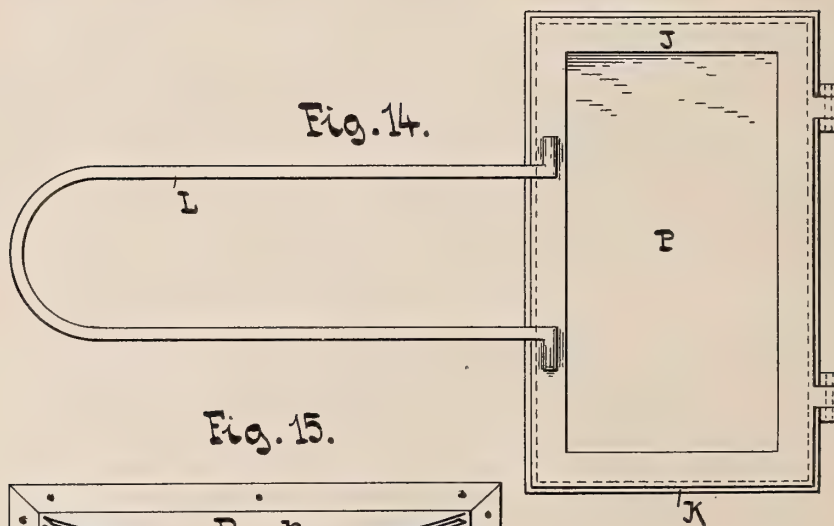
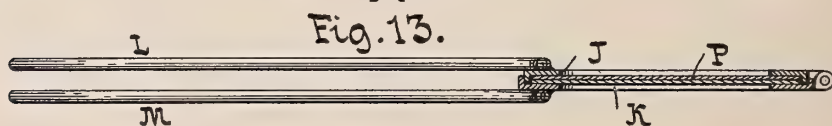
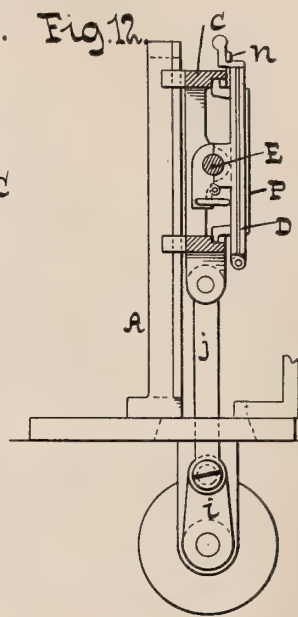
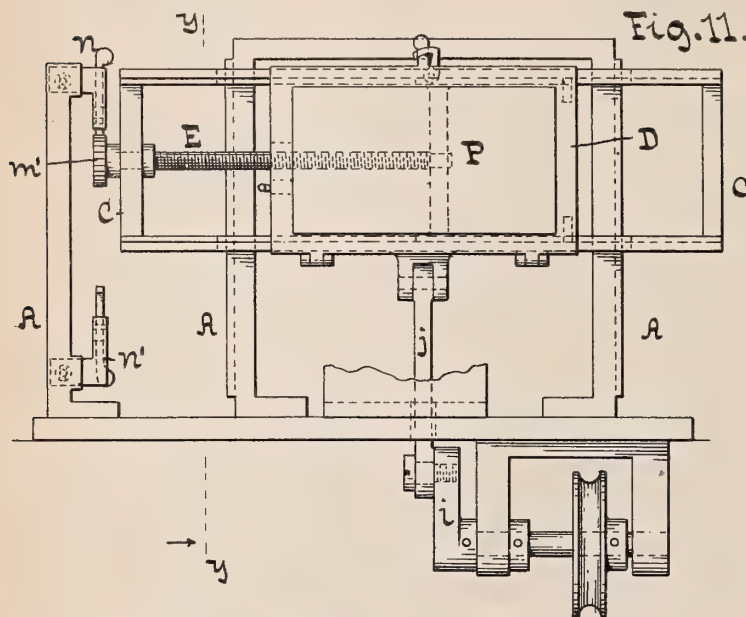
INVENTOR

William Bruening
BY *A. Faber du Faur*
his ATTORNEY

W. BRUENING.
PHONOGRAPH.

No. 462,687.

Patented Nov. 10, 1891.



WITNESSES
A. Faber du Faur
J. Tohr

INVENTOR
William Bruening.
by *A. Faber du Faur*
his ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM BRUENING, OF EAST ORANGE, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 462,687, dated November 10, 1891.

Application filed January 14, 1891, Serial No. 377,724. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRUENING, a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention has reference to improvements in phonographs, and has for its object to provide at a reduced cost a phonograph adapted to give a clear and distinct reproduction of the sound recorded thereon.

To this end my invention consists, essentially, in a phonograph provided with a phonogram-blank or phonogram-holder having a reciprocating motion, means for feeding the holder transversely to the plane of reciprocation, and a recorder or reproducer, all of which, together with other novel features of my invention, is more fully pointed out in the following specification and claims, and illustrated in the accompanying drawings, in which—

Figure 1 represents a side elevation of a phonograph constructed according to my invention. Fig. 2 is a front elevation thereof. Fig. 3 is a vertical central section on a larger scale than the preceding figures. Fig. 4 is a horizontal section in the plane $x x$, Fig. 1, drawn to the same scale as Fig. 3. Fig. 5 is a face view of the diaphragm and attachments. Fig. 6 is a central section of the same. Fig. 7 is an enlarged sectional view of the style. Fig. 8 is a cross-section illustrating details of construction. Fig. 9 is a side elevation of a modified form of the phonograph. Fig. 10 is a front view of the same, with the recording device removed. Fig. 11 is a similar view of a second modification. Fig. 12 is a vertical section in the plane $y y$, Fig. 11. Figs. 13 and 14 illustrate the construction of the dipping-frame used to construct the phonogram-blanks. Fig. 15 is a face view of a phonogram.

Similar letters indicate corresponding parts.

In the drawings, referring at present to Figs. 1, 2, and 3, the letter A designates a frame or standard, to which is pivoted at a a pendulous arm B, carrying at its lower end a carriage C, provided with transverse grooves or ways $b b$. In these ways is held, by means

of the lugs $c c$, the phonogram or phonogram-blank holder D, which is fed transversely to the swinging or reciprocating motion of the carriage by means of a feed-screw E, having bearings at opposite ends in the arm A.

F is the recorder (or reproducer) containing a suitable diaphragm d , which has affixed thereto the style G, the latter being adapted to engage with the mass of the phonogram-blank P. The recorder is hinged at e to the frame A and can be readily swung out of the way when it is desired to insert the phonogram-blank or to remove the phonogram. It is adjusted to its proper position with relation to the phonogram by means of a screw f , passing through the recorder-frame, and through a block g , engaging a socket h in the rigid part of the frame A. (See Fig. 3 especially.) However, any other usual means could be employed to accomplish this end.

An oscillating motion is imparted to the arm B by any suitable means—such, for instance, as the crank i and link j , actuated either by a clock-movement or by any other known motor. In order that the carriage C may travel smoothly, it is provided with a pad or pads k , bearing against a rail l on the frame, a spring m bearing against the opposite side of the rail, holding the carriage to the latter and compensating for wear. (See Fig. 8).

To feed the holder forward once for each stroke or vibration of the arm B, any suitable means may be employed. For instance, as shown in the drawings, a ratchet-wheel m' is secured to the upper part of the feed-screw E, which is alternately engaged by spring-pawls n and n' , secured to the frame on opposite sides of the feed-screw. The pawls are adjustably secured to the frame for permitting the feed to be varied, and cushions $o o$ may be provided to deaden the noise. The nut H' engaging the feed-screw is best made split to permit the holder to be readily removed, if found necessary.

In the operation of the phonograph the recording-point will cut into the phonogram-blank a series of approximately parallel tracks $p p$ of varying depth, corresponding to the intensity of the sound vibrations, said tracks being jointed alternately at opposite ends, in which the reproducing-point subse-

quently travels. It is evident, however, that if the feed takes place just beyond the edges of the phonogram-blank, a series of disconnected approximately parallel tracks will be the result. It will be seen that these successive tracks are cut, traced, or indented by the sound-vibrations in opposite directions, consequently when the reproducing-point is placed in the track it must for a correct reproduction travel in said track in the same direction as the recording point had previously traveled in forming said track, otherwise the reproduction will be unintelligible. If it be found that the reproducing-point is traveling in the wrong direction, one of the pawls n or n' is lifted out of contact with the feed-wheel m' , thereby causing the feed to be missed once, consequently the reproducing-point on the continued motion of the phonogram will travel in the proper direction in said track. In order that the recording device may also serve as a reproducer, the style G extends on both sides of the diaphragm. One end thereof has a sharp-cutting edge, forming the recording-point q , and the other end a blunt or rounded edge r , forming the reproducing-point, so that by reversing the diaphragm the recorder can be changed to a reproducer. The style G may be made in two parts, or, as illustrated in Fig. 7, it is made integral and secured to the diaphragm by a screw-and-nut connection. In order that the recording-point can cut from both sides, it is pointed from four sides, as best seen in Fig. 7. To prevent the diaphragm from buckling, the opposite parts of the style are best guided in spiders s , located on opposite sides of the diaphragm, as shown in Figs. 5 and 6, said spiders consisting of metallic strips secured to the rim at their outer ends, and bearing at their inner ends plates having central holes, through which the opposite parts of the style pass. The diaphragm can be secured to the recorder-frame by any suitable means, and is made adjustable by a screw t and nut u connection. In the example here illustrated I have provided the recorder-frame with two ears d' , which embrace the recorder-rim at opposite sides, Figs. 1 and 2, and within which the recorder can be moved up or down by the adjusting device.

To secure the phonogram or phonogram-blank in the holder D , the latter is provided with a clamping-frame v (see Fig. 3) hinged thereto. Suitable pins, as w , placed in the holder at proper distances apart, serve as a guide to place the blank in its proper position, said pins passing through holes in the blank and entering corresponding recesses in the clamping-frame to securely hold the blank.

In preparing the phonogram-blanks a margin extending about the four sides is left uncoated, with which margin the clamping-frame engages. When the face of the holder is inclined, as shown in Fig. 3, the uncovered margin is slit diagonally at the four corners, or

else the blank is first pressed to the proper shape in a suitable form.

A pointer, as II , secured to the carriage, and a scale, as I , Fig. 1, applied to the holder may be employed, the pointer being hinged, so that it can be thrown to one side when the clamping-frame is to be opened. By the use of the scale certain parts of the recorder can be noted for repetition.

If desired, the holder G can be centrally pivoted to a carriage located and working in the carriage C , whereby it can be adjusted about its center to cause the tracks on the phonogram to correspond with the arc in which the arm swings in case the holders of different phonographs should not exactly correspond.

It is evident that various modifications, all including a reciprocating motion of the phonogram or phonogram-blank holder, can be constructed, therefore I do not wish to restrict myself to any particular reciprocating motion.

In Figs. 9 and 10 I have shown the carriage formed on a pivotal arm as before, but on the outer end of the same the phonogram-blank being curved and presenting a segmental surface to the style.

In Figs. 11 and 12 the carriage is shown to reciprocate in a vertical plane in suitable ways formed in the frame A and the phonogram-holder feed at right angles thereto.

The means for imparting the reciprocating motion in the two latter cases are similar to those shown in the first example and need not be more fully described.

It will be noticed that the tracks produced by the recorder of the two latter phonographs will be parallel.

In place of reciprocating and feeding the phonogram-blank holder, the recording or reproducing device could have the two motions imparted thereto and the holder remain stationary; and, furthermore, instead of having the recording or reproducing device placed with its diaphragm parallel to the phonogram-holder, it could be placed at right angles thereto to obtain transverse vibration.

When a wax compound is used for phonogram-blank, a suitable dipping-frame, such as shown in Figs. 13 and 14, is made use of. It consists of two jaws J and K , hinged together, each of said jaws being made of an open frame-work and provided with a handle, as L and M . The blank is placed between said jaws and repeatedly dipped into the molten mass until the requisite thickness is obtained. When only one side of the blank is to be covered with the mass, two blanks are placed in the dipping-frame at one time.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a phonograph, a reciprocating phonogram-blank or phonogram-holder, means for feeding the holder transversely, and a recorder or a reproducer, substantially as described.

2. In a phonograph, a reciprocating carriage, a phonogram or phonogram-blank holder moving with said carriage, means for feeding the holder transversely, and a recorder or a reproducer, substantially as described.

3. In a phonograph, a reciprocating carriage provided with ways, a phonogram-blank or phonogram-holder adapted to slide in said ways, and a feed-screw for advancing the holder, substantially as described.

4. In a phonograph, a phonogram-blank or a phonogram having a reciprocating motion imparted thereto, means for feeding said phonogram-blank or phonogram transversely, and a recorder or reproducer, substantially as described.

5. In a phonograph, a diaphragm having a style formed on opposite sides with a recording-point and a reproducing-point, and guides for said style, substantially as described.

6. In a phonograph, a reversible diaphragm provided with a style formed on opposite sides with a recording-point and a reproducing-point, substantially as described.

7. In a phonograph, a holder for the phonogram-blank or phonogram, consisting of an open frame, means for securing the phonogram-blank or phonogram therein, a scale I on said holder, and an index H, substantially as described.

8. In a phonograph, the reciprocating carriage C, the holder D, having a feed-motion transverse to the motion of the carriage, and the hinged adjustable recorder F, substantially as described.

9. A phonogram in which the successive tracks are cut from opposite directions, substantially as described.

10. A phonogram having parallel or approximately parallel tracks cut from opposite directions, substantially as described.

11. A phonogram having parallel or approximately parallel tracks thereon joined alternately at opposite ends, substantially as described.

12. A phonogram having parallel or approximately parallel tracks thereon joined alternately at opposite ends, the successive tracks being cut from opposite directions, substantially as described.

13. In a phonograph, the frame A, provided with a guide or guides, a carriage fitted to said guides, means for imparting a reciprocating motion to the carriage, a phonogram-blank holder, a feed-screw, and a recorder, substantially as described.

14. In a phonogram, a reciprocating carriage, a phonogram-holder moving with said carriage and having a feed-motion transverse to the same, and means for interrupting said feed, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 10th day of January, 1891.

WILLIAM BRUENING.

Witnesses:

CHAS. S. HAYES,

A. FABER DU FAUR.

1142657

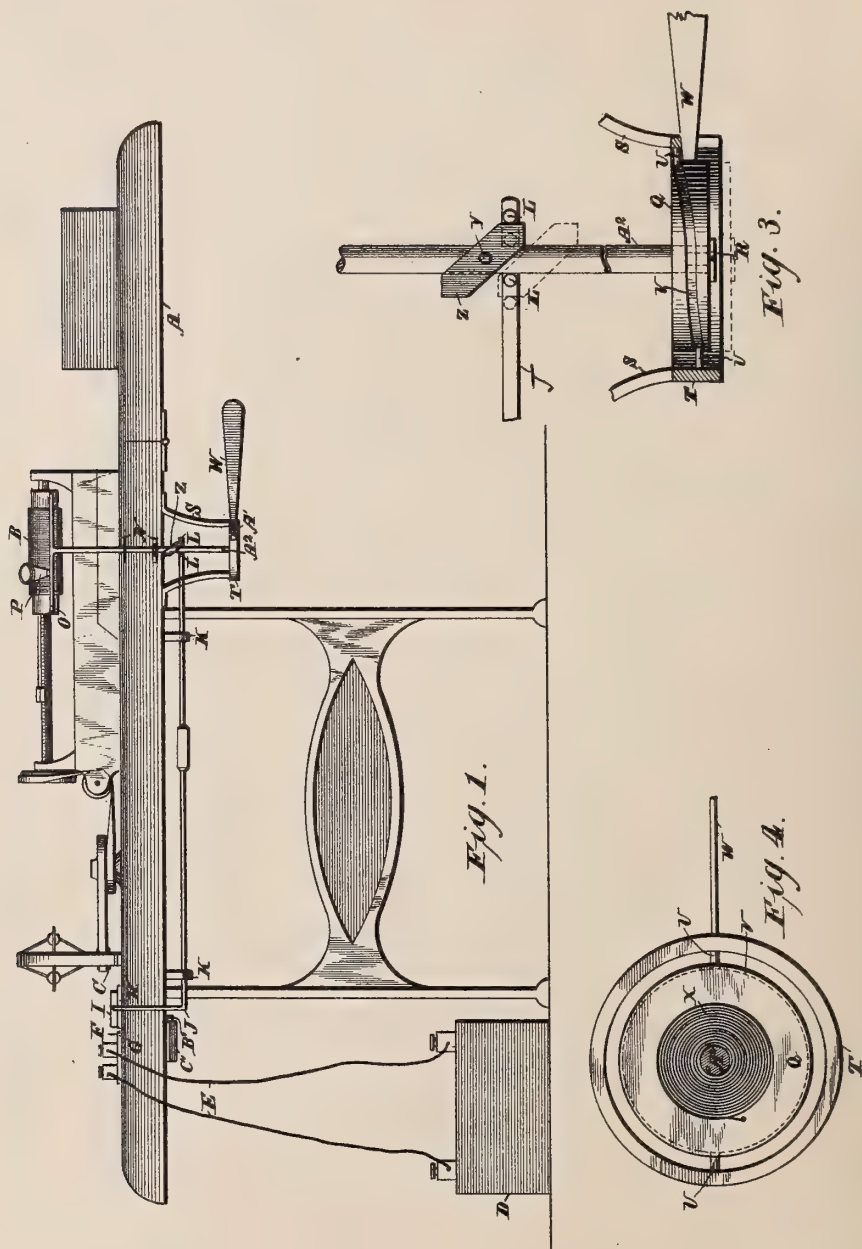
(No Model.)

2 Sheets—Sheet 1.

H. T. HOLTZ.
PHONOGRAPH.

No. 463,989.

Patented Nov. 24, 1891.



Witnesses

Louis S. Julihn.

C. P. Ellwell

Inventor

Henry T. Holtz

By *Stephen M. Atkins*
Attorneys

(No Model.)

2 Sheets—Sheet 2.

H. T. HOLTZ.
PHONOGRAPH.

No. 463,989.

Patented Nov. 24, 1891.

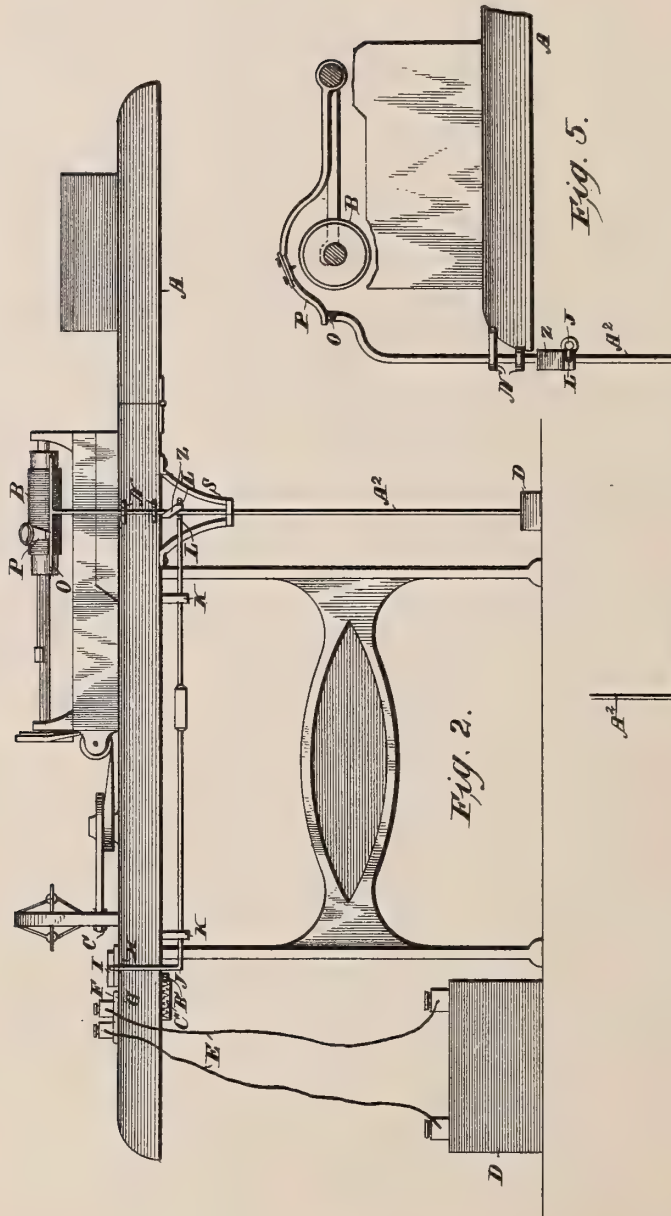


Fig. 2.

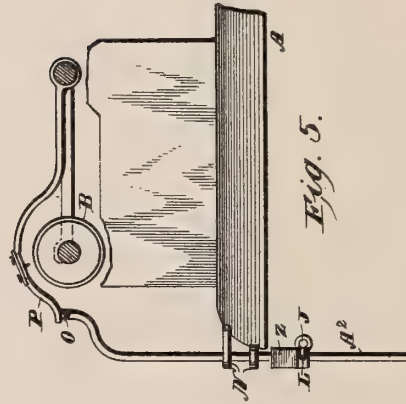


Fig. 5.



Fig. 6.

Witnesses

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C. P. Elwell

Inventor
Henry T. Holtz.

By Kaplun & Atkins
Attorneys

UNITED STATES PATENT OFFICE.

HENRY T. HOLTZ, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF
ONE-HALF TO WILLIAM MAURICE LERCH, OF BALTIMORE, MARYLAND.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 463,989, dated November 24, 1891.

Application filed April 23, 1891. Serial No. 390,161. (No model.)

To all whom it may concern:

Be it known that I, HENRY T. HOLTZ, of the city of Washington, District of Columbia, have invented certain new and useful Improvements in Phonographs, of which the following is a specification, reference being had to the accompanying drawings.

One object of my invention is to produce a start-and-stop device for phonographs or talking-machines in which there shall be a movable part that I will call a "prime mover," adapted by its operation to start and stop the motor and the machine and connect and disconnect the diaphragm-pin with the cylinder, so that an operator may have ample time to transcribe a sentence or a part of a sentence, or can allow any period of time to elapse between the time of making transcriptions, and while he is transcribing or during such period of time the machine will be at rest.

Another object of my invention is to produce a start-and-stop device for phonographs operated by electricity, whereby the labor of transcribing recorded speech is facilitated and the machine is operated at a considerable saving of the electric current. Phonographs, although adapted to be run by any suitable motive power, are to a large extent operated by electric motors. The source of electricity employed is in many cases a portable pile or battery which has a limited capacity—that is, it may produce a required energy for a limited number of hours, after which it has to be renewed. It is the practice at present in transcribing the records of a phonograph to take a sentence from dictation, as it were, and after the machine has repeated that sentence to interrupt its feed and transcribe its record. This is usually done by raising a lever by hand or by some species of clutch mechanism by which the motor is disengaged from the feeding mechanism of the phonograph. The motor, however, continues in motion and the electric energy is wasted. One reason for the motor being allowed to run uninterruptedly has been that its velocity must always be equal or nearly equal in repeating speech to that which was employed in recording it. A difficulty, therefore, has

been in attempting to prevent the waste of the electric current and at the same time produce the best effects that the velocity would in the beginning be too greatly diminished and part of the record would after each interruption be obscured or lost. By my invention I provide for starting the motor so far in advance of lowering the needle against the face of the revolving cylinder that the motor shall have first attained the requisite speed before the machine begins to speak. By this means I secure the most perfect practical results in the operation of the phonograph itself, am able to save about one-half the electric current ordinarily used in operating it, and consequently am able to run the machine at one-half the ordinary cost. In addition to the advantages above recited, by employing mechanical means for lifting the needle from the face of the revolving cylinder and returning it thereto I insure the return of the needle after each interruption to the same place from which it was raised. The needle, being secured to a disk which is hung upon a pivoted lever, cuts into the surface of the cylinder in lines about one one-hundredths of an inch apart. It is therefore necessary, in order to reproduce speech, for the needle to follow evenly in the groove as originally cut. When, therefore, the machine is in operation and the needle is raised away from the face of the cylinder for the purpose of transcribing a sentence which has been repeated, it is necessary, when the needle is again let down, that it should strike exactly in the same groove. This may be done by hand; but a slight pull to one side or the other will throw the needle out of place. This possibility, as above suggested, is entirely avoided by my invention.

In the accompanying drawings, Figure 1 is a front elevation of a phonograph with motor equipped with my device. Fig. 2 is a similar view showing a modification of the same. Fig. 3 is an elevation of a portion of my device, showing the cam-frame in section. Fig. 4 is a top plan view of the cam. Fig. 5 is an end view of the cylinder of the phonograph and its adjacent parts, showing the relation of my

raising and lowering device to the diaphragm. Fig. 6 is a detail view of a portion of the modification shown in Fig. 2.

Referring to the letters on the drawings, A indicates the table of an ordinary phonograph.

B indicates the recording-cylinder of the machine, which is operated through mechanism of such well-known construction as not to require particular description here. It is driven by a motor C, communicating with the source of electricity D by means of the wires E through the electric switch F, which may be of any ordinary construction—such, for instance, as fixed plates G and H, insulated from each other, and a sliding plate I, adapted to slip over the surfaces of the fixed plates and make connection between them. To the sliding plate is fastened a rod J by any suitable means, preferably so as to be insulated from it. This rod should be bent or constructed so that its main portion may run parallel with the lower edge of the table and preferably a little below it.

K indicates bearings of any suitable sort for supporting the rod and should be adapted to allow it to move freely through them.

L indicates pins fixed to the free end of the rod and projecting from it a suitable distance, between which is the vertically-movable lifting-bar A², which is firmly carried in suitable bearings N against the face of the table. The lifting-bar is provided across its upper end with a horizontal lifting-piece O, which extends the entire length of the cylinder of the phonograph and immediately beneath the path of the disk-lever P. (Clearly shown in Fig. 5 of the drawings.) The location of this lifting-piece is such that it will engage with and lift the disk-lever at any point of the travel of the cylinder. It will with equal certainty lower the disk-lever in place when desired. The lifting-piece, when the machine is in operation, is separated from the disk-lever, so that it offers no impediment to the free working of the machine. Upon the lower end of the lifting-bar is provided with a cam-disk Q, secured thereto by means of the screw R.

S indicates a frame secured to the lower side of the table and provided at its lower end with a band T, which encircles the cam and carries the fixed pins U, that enter the groove V in the side of the cam.

W indicates a lever, which in this instance is the prime mover, secured at one end to the cam, by means of which the cam may be turned upon its axis through the slot A' in the band, and the lifting-bar thereby raised or lowered. The normal position of the horizontal lifting-piece is in engagement with the disk-lever, and consequently I provide within the top of the cam-disk a volute spring X, fastened at its inner end to the lifting-bar as an arbor and at its outer end to the wall of the disk. To rotate the disk, therefore, it is necessary to overcome the resistance of this

spring, which, when pressure is relieved, returns the cam to the normal position. Between the pins L of the rod J, I fasten by a set-screw Y or other suitable means to the lifting-bar a cam-collar Z, so located that when the lifting-bar is raised or lowered one or the other of the faces of the cam-collar strikes against one or the other of the pins L and moves the rod J horizontally one way or the other, thereby operating the electric switch to make or break contact. This collar must be located with reference to the horizontal lifting-piece O, so that it will begin to operate the electric switch as soon as the slightest motion is imparted to the lifting-bar and somewhat in advance of the disengagement of the horizontal lifting-piece from the disk-lever. Consequently when the lifting-bar shall have been operated by the lever W the electric switch will have first been operated to set the motor in motion and time will have been allowed it to reach the required velocity before the machine begins to speak.

In order to interrupt the free motion of the horizontal rod J after the operation of the electric switch, a spring-actuated plunger B' may be provided. This plunger is fixed in a case C' to the bottom of the table in the path of the rod, so that the rod, after having operated the switch, will strike it and be impeded by it.

In Fig. 2 a modification is shown by which the cam mechanism for raising and lowering the lifting-bar may be dispensed with. In that figure the lifting-bar is shown as prolonged and fastened to a spring-actuated pedal D', that may be fastened to the floor and operated by foot.

The operation of my invention is as follows: Assuming that a record has been made upon the cylinder in the machine and that the operator is engaged in transcribing it, we will suppose that he has written out a sentence and desires to take up the record where he left off. The machine being in its normal condition of rest, he will with the knee touch the lever W and swing the cam-disk around, whereupon connection is made at the electric switch and the motor set in motion. Sufficient velocity will have been attained by the time the continued rotation of the cam-disk lowers the horizontal lifting-piece enough to bring the needle carried by the diaphragm in contact with the cylinder, so that as soon as this occurs the machine begins to speak clearly and distinctly. It will continue so to speak until its operation is interrupted by the release of the lever W, when the machine immediately returns to rest and all flow of electric current is interrupted.

I do not desire to confine myself to the details of construction herein described, because they may be varied in many ways without departing from the scope of my invention.

What I claim, broadly, is—

1. In a phonograph or talking-machine, the combination of a prime mover, a motor connected therewith so as to be started and stopped by the motion of the prime mover, the cylinder, and a diaphragm and needle also connected with the prime mover so as to be lowered and raised into and out of contact with the cylinder by the motion of the prime mover, substantially as set forth.

2. In a phonograph or talking-machine, the combination of a revoluble cylinder, a prime mover, an electric circuit, one member of which is connected with the prime mover so as to be thrown into and out of circuit thereby, and a diaphragm and needle, also connected with the prime mover so as to be thrown into and out of operative connection with the cylinder thereby, these elements being so arranged that a slight or partial movement of the prime mover will complete the electric circuit and a further movement will connect the diaphragm-needle with the cylinder, substantially as set forth.

3. The combination, with a phonograph provided with an electric motor and a source of electrical supply, of a switch interposed between the latter and the motor, a lifting-piece adapted to raise and lower the diaphragm of the phonograph, and connecting mechanism between the switch and the lift-

ing-piece, whereby they may be operated, substantially as set forth.

4. The combination, with a phonograph provided with an electric motor and a source of electrical supply, of an electric switch interposed between the latter and the motor, a lifting-piece adapted to raise and lower the diaphragm of the phonograph, and mechanism connecting the switch with the lifting-piece and arranged so as to operate the switch before operating the lifting-piece, substantially as and for the purpose specified.

5. The combination, with a phonograph and its table provided with an electric motor and a source of electrical supply, of a switch interposed between the latter and the motor, a lifting-piece adapted to operate the diaphragm of the phonograph, a lifting-bar secured to the lifting-piece and moving in fixed bearings upon the table, a cam secured to the lifting-bar, a rod connecting the switch thereto and adapted to be operated by the cam, and means for raising and lowering the lifting-bar, substantially as set forth.

In testimony of all of which I have hereunto subscribed my name.

HENRY T. HOLTZ.

Witnesses:

JOSEPH L. ATKINS,
S. G. HOPKINS.

(No Model.)

H. T. HOLTZ.

STARTING AND STOPPING DEVICE FOR PHONOGRAPHS.

No. 463,990.

Patented Nov. 24, 1891.

Fig. 1.

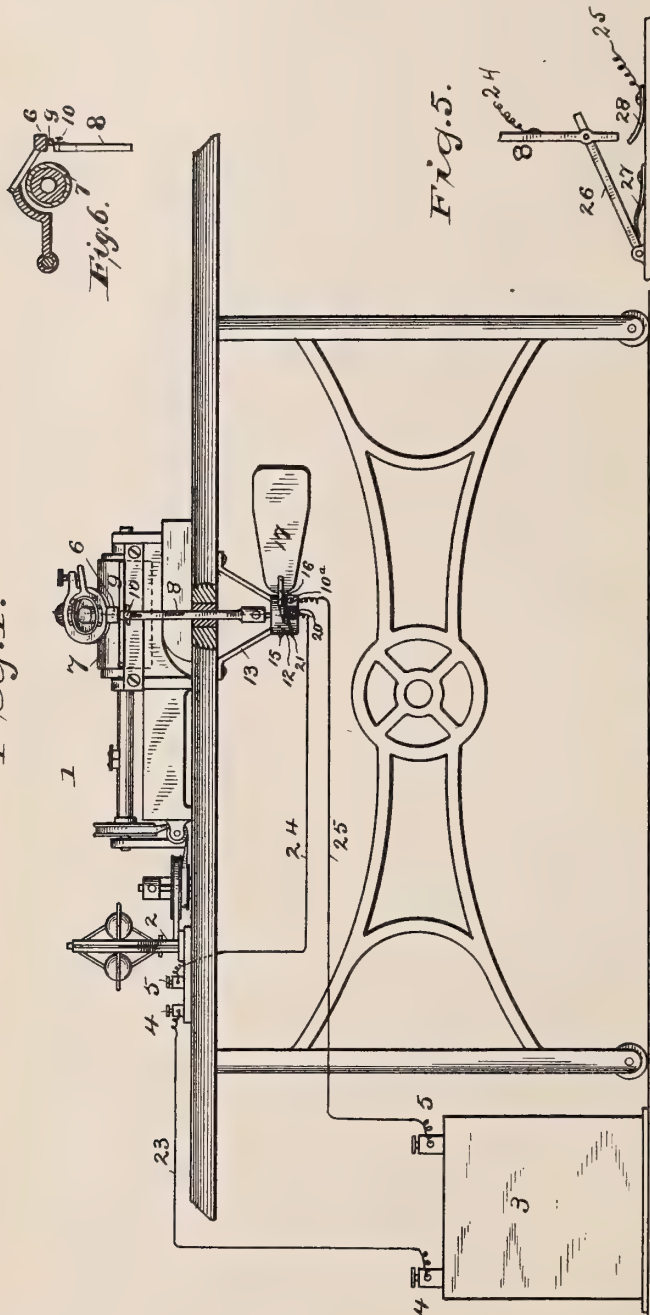


Fig. 5.



Fig. 4.

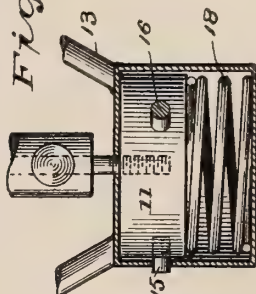


Fig. 3.

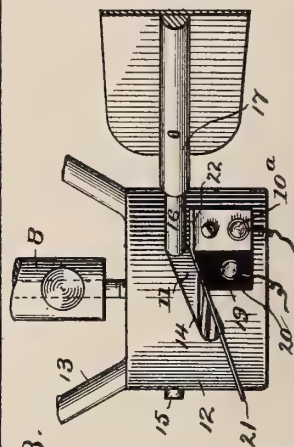
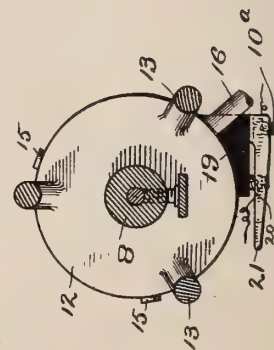


Fig. 2.



Witnesses

H. A. Lamb

Stephen J. Jannus

Inventor

Henry T. Holtz

By

Kaplan & Kottus
Attorneys

UNITED STATES PATENT OFFICE.

HENRY T. HOLTZ, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-HALF TO WILLIAM M. LERCH, OF BALTIMORE, MARYLAND.

STARTING AND STOPPING DEVICE FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 463,990, dated November 24, 1891.

Application filed July 11, 1891. Serial No. 399,197. (No model.)

To all whom it may concern:

Be it known that I, HENRY T. HOLTZ, of the city of Washington, in the District of Columbia, have invented certain new and useful Improvements in Starting and Stopping Devices for Phonographs or Talking-Machines, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to produce improved means of starting and stopping phonographs, by which their working speed and accuracy may be increased with a saving of electricity, which is the motive power ordinarily employed in operating them. The method now in general use is to operate by hand an electric switch and by the same means a separate lever which carries the diaphragm of the machine. Care must be taken in securing repetition of the recorded speech that the machine is well in motion before the needle on the diaphragm comes in contact with the inscribed cylinder, and in order to accomplish this the motor must be first set in motion before the diaphragm is lowered.

My invention consists in improved combined means of setting the motor in motion at the proper time and depressing the diaphragm—by the pedal extremities, for instance—whereby the hands are left free for transcribing, as upon a typewriter, as more particularly defined in the appended claims.

In the accompanying drawings, Figure 1 is a front elevation of a phonograph with my invention attached. Fig. 2 is a top plan view of the cam mechanism detached. Fig. 3 is a front elevation of the same, and Fig. 4 a central vertical section thereof. Fig. 5 is a view of a modification of my invention. Fig. 6 is a vertical sectional view in detail through the stylus, lever 6, and lifting-rod 8.

Referring to the figures on the drawings, 1 indicates a phonograph provided with a motor 2 and a source of electrical supply 3—as, for instance, a battery.

4 5 indicate binding-posts upon the motor and battery, respectively.

6 indicates the ordinary diaphragm-lever, adapted to carry the diaphragm across the face of the cylinder 7.

8 indicates a vertically-moving bar carried

in suitable bearings in the table and provided with a cross-piece 9, that may be adjusted by means of a thumb-screw 10. This cross-piece extends in the path of the diaphragm-lever and is adapted to raise and lower it at any point of its travel away from or toward the surface of the cylinder. The adjustment of this part of the raising and lowering of the bar 8 is such as to accurately operate the diaphragm-lever.

Any suitable means for raising and lowering the bar may be employed—such, for instance, as a cam mechanism illustrated in Fig. 3 of the drawings, in which a cylindrical head 11 is revolvably fastened to the lower end of the lifting-bar and is fitted within a cylindrical case 12, that is carried by suitable hanging arms 13 beneath the table and is provided in its sides with cam-slots 14, in which work pins 15 16. The pin 16 constitutes one member of the electric circuit, which is completed by the wing-shaped contact-piece 21 when the two are in contact. The cylindrical head 11 may be regarded as a part of the bar 8, being intimately connected with it, as shown in the drawings, and being susceptible of more intimate relation by slight changes of construction if such at any time not inconsistent with my invention should be preferred. One of the pins 16 is provided with a lever-handle 17, that is adapted to be rotated by the knee of the operator. This lever is what I call the “prime mover.” The movement of the pins through their slots tends to raise and lower the head 11, to which they are attached, and to impart the same motion to the lifting-bar 8. The bar is kept in the elevated position by a coiled spring 18, fastened at one end to the cylindrical head and at the other to the cylindrical case.

19 indicates a suitable block of insulating material. 20 indicates a binding-screw passing through the same and establishing electrical communication with the cylindrical case 12 and through that with the cylindrical head 11 and the pin 16.

21 indicates a resilient wing-shaped contact-piece fixed upon the block 19 and insulated thereby. This contact-piece is cut away, as indicated at 22 in the drawings, so that when the pin 16 is in its normal position un-

der the action of the spring 18 they will be separated by a short distance and prevent electrical communication. Throughout the remainder of its extent the contact-piece extends in the path of the pin 16 and presses against it.

In practice one of the binding-posts on the battery is united directly to one of the binding-posts on the motor by a conductor 23. Conductors 24 and 25 respectively connect the other binding-post of the motor and of the battery with the binding-screw 20 and the contact-piece 21, respectively. It is apparent, therefore, that when contact between the pin 16 and the contact-piece 21 is made the motor will be set in motion and when it is broken the motor will cease to run. There is a certain amount of lost motion in rotating the cylinder 11, so that the pin 16 strikes the contact-piece 21 before the bar 8 begins to descend under the operation of the cylinder. By the time its complete descent has been made and the needle on the diaphragm is brought into contact with the surface of the cylinder the motor will have had time to come into perfect operation, so that the machine is ready to do its work instantly as long as the lever 17 is held against the tension of the spring 18. As soon as released it flies back to its normal position under the tension of the spring, leaves the bar 8, elevates the diaphragm, and stops the motor. While this is taking place the operator may transcribe the record of the machine and repeat the operation as often and for as long an interval as is necessary to take down the record readily and with accuracy.

Instead of the means above described for raising and depressing the bar 8, a pedal may be employed, as illustrated in Fig. 5 of the drawings, in which an oscillating foot-piece

26 is attached to the prolonged end of the bar and is kept normally in the elevated position by a spring 27. Electrical communication is established through this pedal and a contact-piece 28 in the same manner and for the same purpose as above described.

I do not claim everything set forth in the above specification as a part of my present invention, having already embodied part of it in my previous application, Serial No. 390,161, filed April 23, 1891.

What I claim is—

1. The combination, with a phonograph, electric motor, and source of electrical supply, of a vertically-movable bar adapted to raise and lower the diaphragm of the phonograph, a pin carried with the bar, a contact-piece in the path of the pin, adapted to make and break electrical communication, respectively, when the pin touches the contact-piece or is separated from it by the raising and lowering of the bar, and conductors between the motor, the source of electrical supply, the bar, and the contact-piece, respectively, substantially as set forth.

2. The combination, with a phonograph, electric motor, and source of electrical supply, of means for making and breaking connection between the motor and its source of supply, one part of said means being directly connected with the diaphragm-lever of the phonograph, whereby its being raised or lowered from the recording-cylinder makes or breaks connection, as set forth.

In testimony of all which I have hereunto subscribed my name.

HENRY T. HOLTZ.

Witnesses:

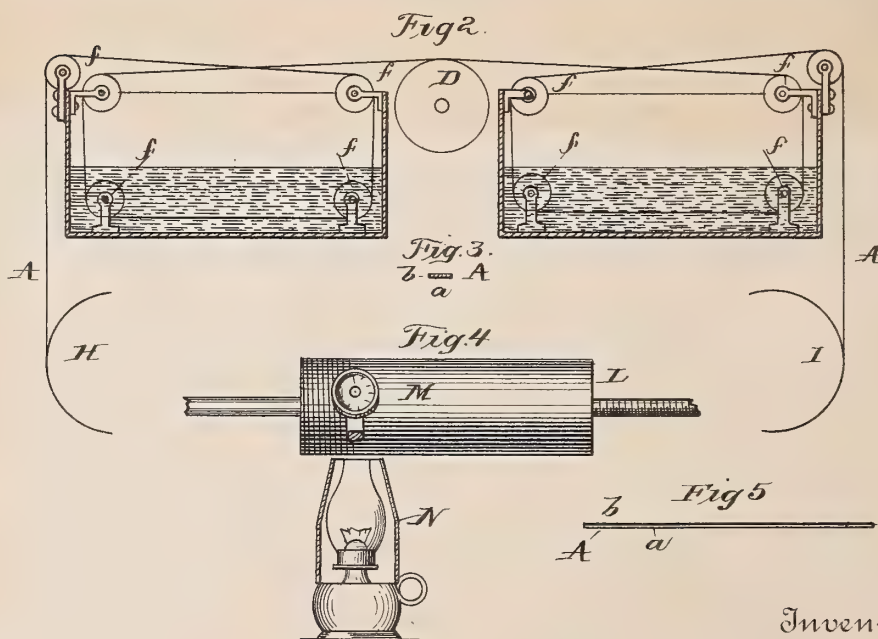
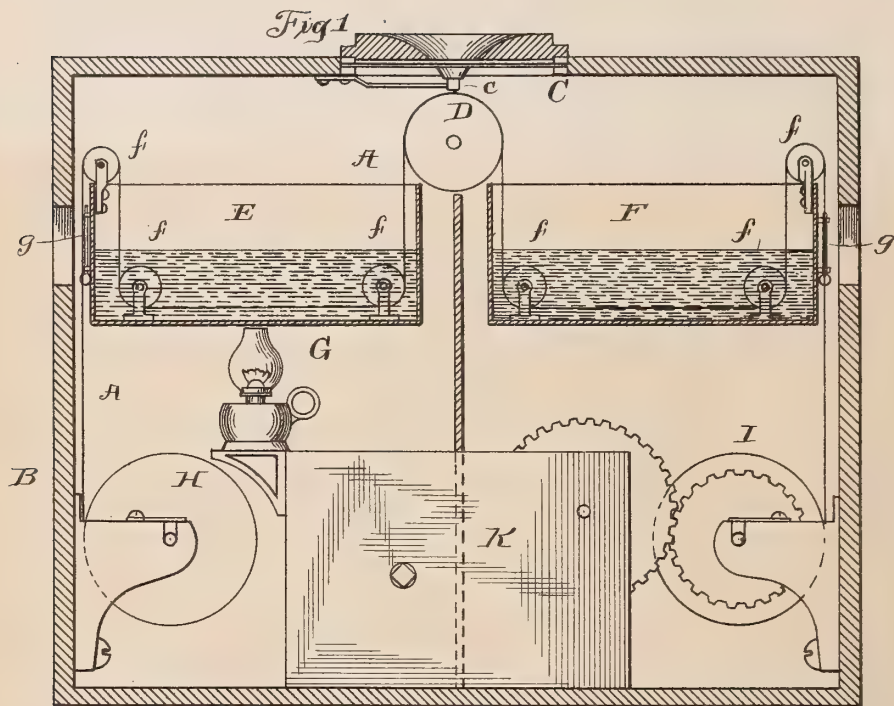
THOS. S. HOPKINS,
JOSEPH L. ATKINS.

(No Model.)

G. H. HERRINGTON.
PHONOGRAPH.

No. 464,476.

Patented Dec. 1, 1891.



Witnesses
E. C. Rowland,
William Eger.

Inventor
George H. Herrington
By his Attorneys Geo. S. Lee

It is hereby certified that Letters Patent No. 464,476, granted December 1, 1891, upon the application of George H. Herrington, of Wichita, Kansas, for an improvement in "Phonographs," were erroneously issued to said Herrington as sole owner of the invention; that said Letters Patent should have been issued to said *George H. Herrington and Edward H. Johnson, jointly*, each being owner of one-half interest, as shown by the record of assignments in this Office; and that said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 8th day of December, A. D. 1891.

[SEAL.]

CYRUS BUSSEY,

Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,

Commissioner of Patents.

UNITED STATES PATENT OFFICE.

GEORGE H. HERRINGTON, OF WICHITA, KANSAS.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 464,476, dated December 1, 1891.

Original application filed September 11, 1886, Serial No. 213,278. Divided and this application filed August 22, 1888. Serial No. 283,459. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HERRINGTON, of Wichita, in the county of Sedgwick, in the State of Kansas, have invented a certain new and useful Improvement in Phonographs, of which the following is a specification.

In my application filed September 11, 1886, Serial No. 213,278, of which this application is a division, is set forth and claimed a method of recording sound-vibrations, in which the recording medium is first rendered plastic, then passed under the vibrating point or needle of the recording-instrument while in such plastic condition, and finally allowed to harden to set the impression and produce a permanent record. My present invention relates to the apparatus for carrying this method into effect, which apparatus is shown and described, but not claimed, in the application referred to, I having been required by the Commissioner of Patents to embody the apparatus in a separate application.

In carrying my invention into effect I employ as a recording medium to receive the needle-indentations a material capable of being softened or made plastic and of afterward becoming hardened. I cause such surface to receive the indentations while in its softened or plastic condition, and it retains them when it becomes hard again. I prefer to employ a substance, such as boiled tar, pitch, resin, asphalt, dental wax, or similar hard substances or compounds which become plastic when heated, and by the employment of heat I soften to the desired degree this surface as it passes under the point of the diaphragm-needle, and then by cooling harden the surface to give the record permanency. The heat-affected medium is preferably applied as a coating to a suitable supporting-thread, strip, or sheet of metal, fabric, paper, or rubber, and this supporting-body is also preferably flexible, so as to be readily wound upon spools and passed around wheels or drums. The recording-surface may also be covered with an extremely thin metallic foil or be powdered to prevent sticking to the needle or to the wheels or rollers while in a plastic condition. The heat may be applied in any suitable way, and air, water, or steam

may be used, the recording medium passing through a heating-chamber or over or around heating drums or rolls just before reaching the diaphragm-needle. The cooling may be effected by an air or water chamber, or by drums, or by other suitable means.

The phonograph may have a motor to move the recording medium under the point of the diaphragm-needle, and the same machine may, by the removal of the heating and cooling devices, be used to reproduce sound from such a record as has been described.

The same method and essentially the same apparatus can be employed for recording the movements of telephonic or telegraphic apparatus, so as to register messages sent by such instruments without departing from the spirit of my invention.

In the accompanying drawings, forming a part hereof, Figure 1 is a vertical section of a simple form of apparatus, illustrating the invention. Fig. 2 is a similar view of some of the principal parts of a modified form of apparatus. Fig. 3 is a cross-section of the recording-strip used with the apparatus of Figs. 1 and 2. Fig. 4 is a side elevation and partial section illustrating the application of the invention to the ordinary form of phonograph, and Fig. 5 is an edge view of a recording-sheet such as would be used with the apparatus of Fig. 4.

The recording strip A or sheet A' has a flexible body *a*, of thin metal, fabric, paper, rubber, or other suitable material, provided with a surface *b* of the recording medium, such as boiled tar, pitch, resin, asphalt, hard dental wax, or other similar substance or compound, and this surface may or may not be powdered or covered with extremely thin metallic foil, as before set forth.

In the apparatus shown in Figs. 1 and 2 a suitable box or frame B is provided for supporting and inclosing the parts. The ordinary phonograph-diaphragm C is supported in an opening in the top of this box, and beneath the diaphragm is the needle *c*, mounted in the ordinary way. Directly below the needle *c* is the roller D, over which the recording-strip A passes in a suitable guiding-groove, this roller serving to bring the recording-strip into contact with the point

of the diaphragm-needle. Heating and cooling chambers E and F are supported in the box B on opposite sides of the roller D, and are provided with wheels or rollers *f* for guiding and directing the recording-strip. A lamp G is shown for heating the chamber E and the recording-strip passing through it. Thermometers *g* are shown, by which the temperature of the chambers E F can be seen and regulated. Rollers H I carry the recording-strip, and a motor K gives the necessary movement to the strip.

In Fig. 2 the wheels or rollers *f* of the heating and cooling chambers are arranged so that in passing around them the recording-surface of the strip will not touch these wheels or rollers.

In Fig. 4 an ordinary phonograph-cylinder L is shown upon which the sheet A' is placed. The phonograph mouth-piece is shown at M. A lamp N is shown for heating the recording-surface of the sheet to a plastic condition as it passes under the diaphragm-needle. The recording-surface is cooled by the air as it passes from the influence of the lamp.

The recording medium is made as plastic as possible without injury as it passes under the diaphragm-needle, thus giving the greatest possible freedom of movement to the diaphragm, while the subsequent cooling by the atmosphere or artificially gives the recording medium a permanent hardness. When a message or communication has once been registered on the strip or sheet by a phonograph, telephone, or telegraph instrument, it can be repeated any number of times and can be handled without injury to the impressions and sent to any distant point to be repeated without the aid of a skillful operator at that point.

By removing the lamp or other heating medium the same apparatus may be employed to reproduce the sounds by running the strip

or sheet under the diaphragm-needle, so that its point will follow the sound-wave impressions or indentations.

It will be understood that I do not limit myself to the use of any particular material or compound as a recording medium, as any material or compound may be employed which when heated is sufficiently yielding or plastic to readily receive impressions and which will set and retain the impressions when cold.

What I claim is—

1. The combination, with a phonograph diaphragm and needle, of a traveling recording medium composed of a material or compound capable of being made plastic by heat, and means for heating and cooling such medium, substantially as set forth.

2. The combination, in a phonograph, of a strip or sheet phonogram-blank having a flexible body and a covering or surface of a material or compound capable of being made plastic by heat, and means for heating said material or compound, substantially as described.

3. The combination, with a phonograph diaphragm and needle, of a traveling recording strip or sheet having a flexible body and a surface of a material or compound capable of being made plastic by heat, and means for heating and cooling the surface of such strip or sheet, substantially as set forth.

4. The combination, with a phonograph diaphragm and needle, of a traveling recording medium capable of being made plastic by heat, a motor for moving such medium, and means for heating and cooling such medium, substantially as set forth.

This specification signed and witnessed this 2d day of August, 1888.

GEORGE H. HERRINGTON.

Witnesses:

JOHN P. ROGERS,
A. T. OWEN.

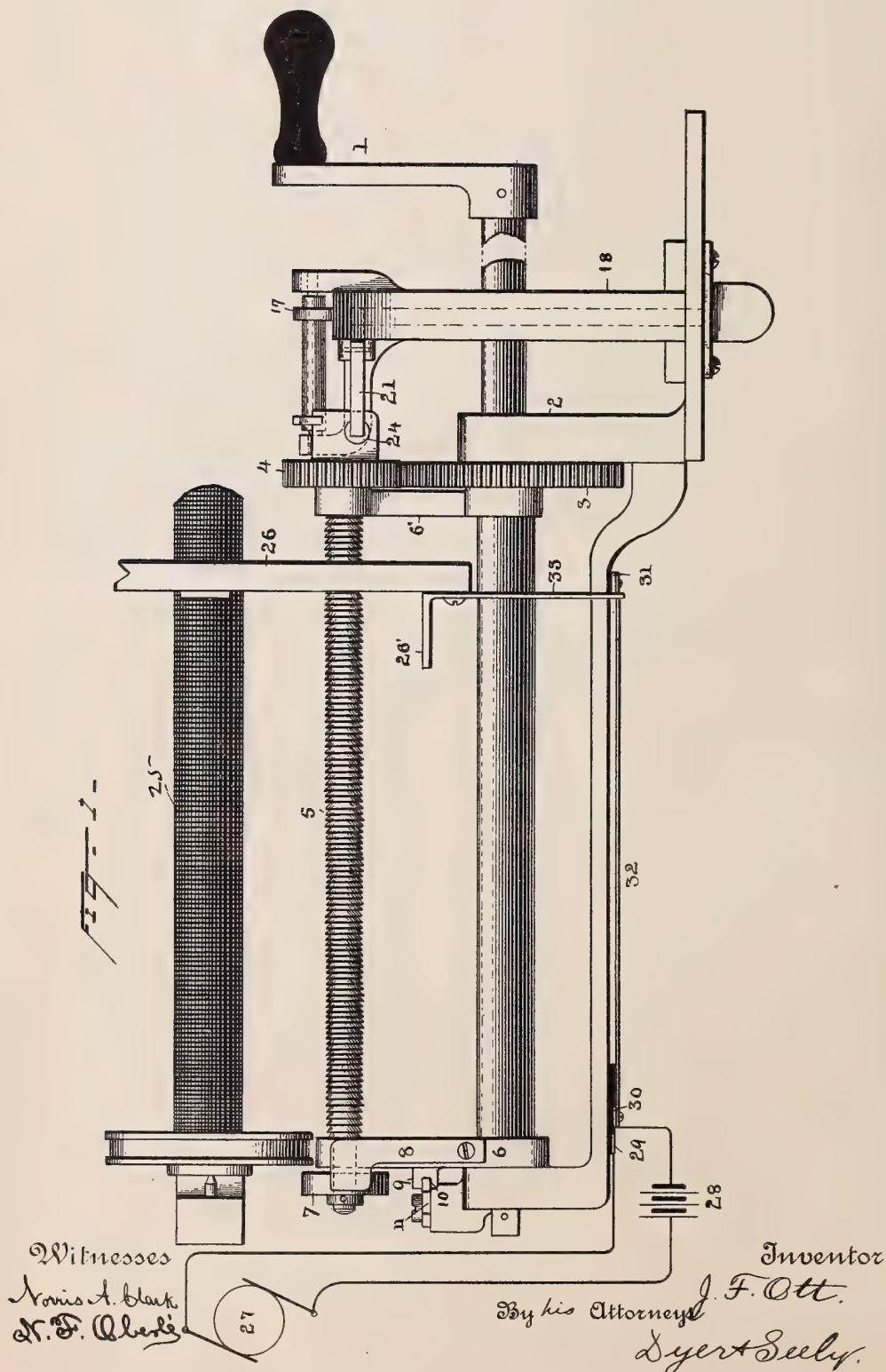
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3 Sheets—Sheet 1.

J. F. OTT.
ATTACHMENT FOR PHONOGRAPHS.

No. 466,922.

Patented Jan. 12, 1892.



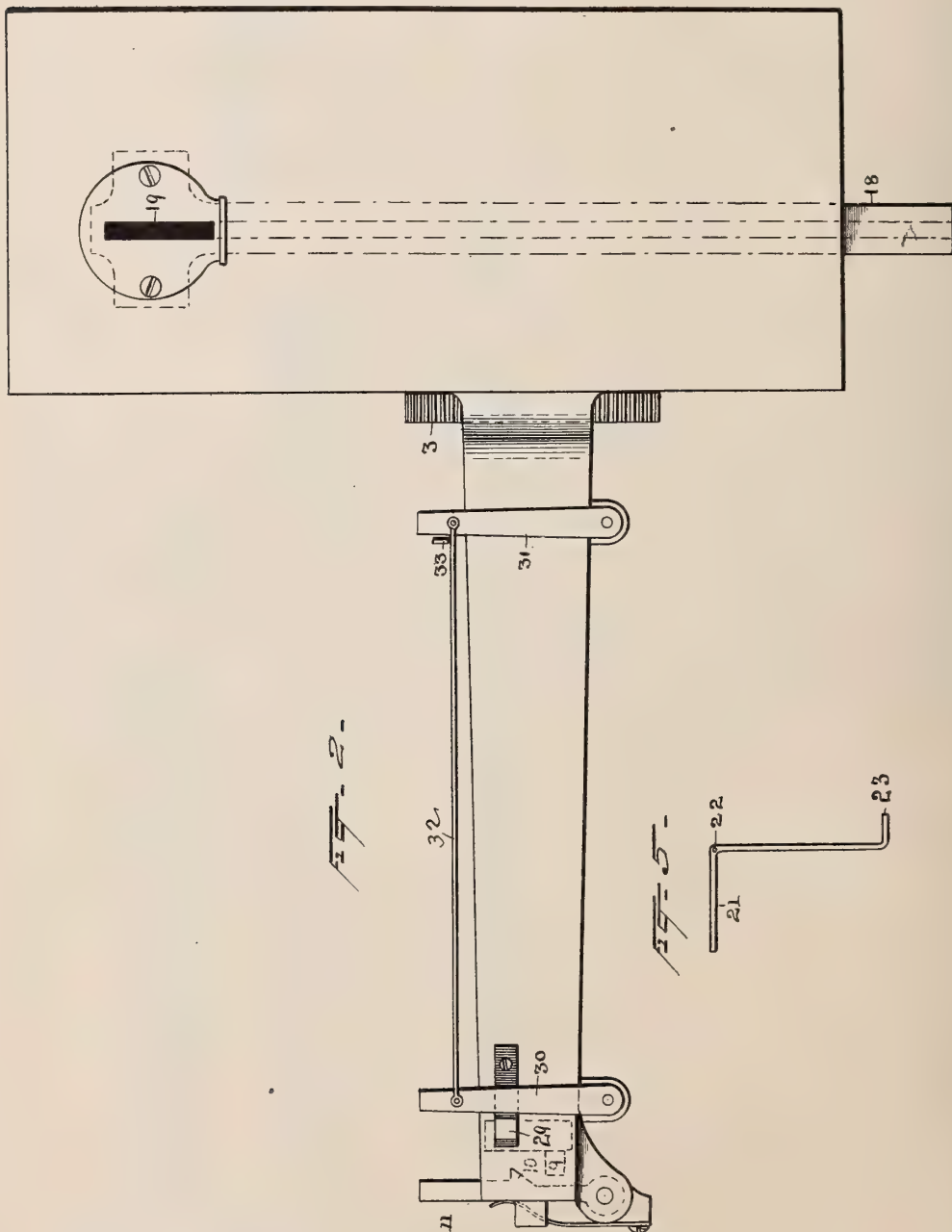
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3 Sheets—Sheet 2.

J. F. OTT.
ATTACHMENT FOR PHONOGRAPHS.

No. 466,922.

Patented Jan. 12, 1892.



Witnesses
Norris A. Clark
W. F. Oberly

Inventor
J. F. Ott.
By his Attorneys
Sydney Seely.

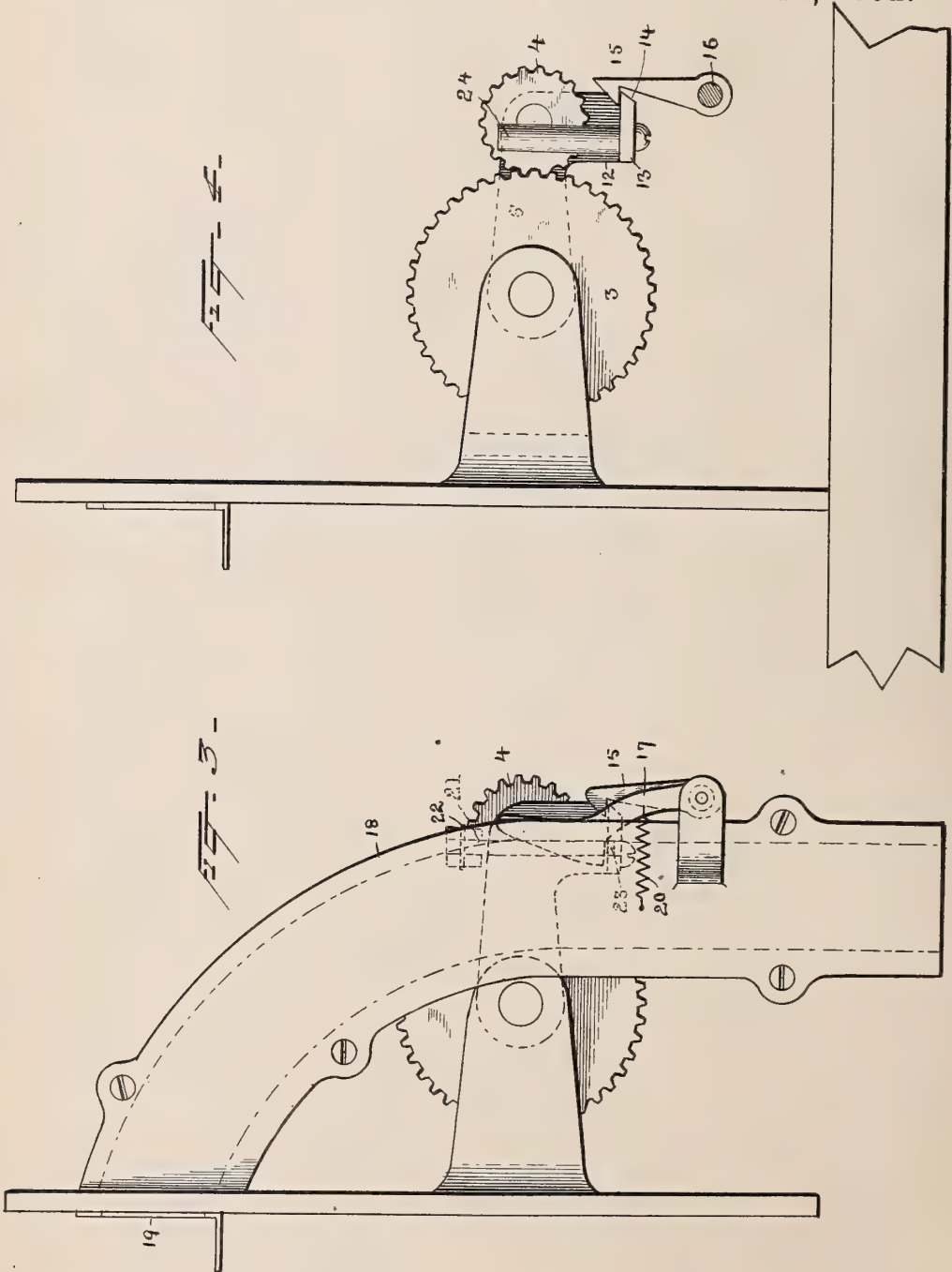
(No Model.)

3 Sheets—Sheet 3

J. F. OTT.
ATTACHMENT FOR PHONOGRAPHS.

No. 466,922.

Patented Jan. 12, 1892.



Witnesses
Norris A. Clark.
Dr. F. Clarke

Inventor
J. F. Ott,
By his Attorney
Sydney Seely.

UNITED STATES PATENT OFFICE.

JOHN F. OTT, OF ORANGE, ASSIGNOR TO THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

ATTACHMENT FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 466,922, dated January 12, 1892.

Application filed December 29, 1890. Serial No. 376,067. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. OTT, a citizen of the United States, residing in Orange, county of Essex, and State of New Jersey, have invented a certain new and useful Improvement in Attachments for Phonographs, of which the following is a specification.

My invention relates to means for returning the reproducer of a phonograph to the end of the phonogram-blank at which the record commences, and is especially adapted to that class of phonographs the use of which is controlled by a nickel or other coin or token.

The invention consists in the apparatus hereinafter described for accomplishing the object above mentioned.

In the accompanying drawings, which illustrate the apparatus, Figure 1 is a plan view of the attachment. Fig. 2 is a view at right angles thereto. Fig. 3 is a side view of the coin-passage and the coin-controlled devices, a part of the coin-passage being broken away. Fig. 4 is a view looking in the same direction, the coin-passage and several other parts being omitted; and Fig. 5 is a detail view of the coin-releasing lever or trip.

It is common in phonographs to have a fine screw driven by an electrical or other motor to move the reproducer slowly along the phonogram-blank at the same time that the blank rotates and to have a second screw of greater pitch and rotating in an opposite direction or having an oppositely-inclined screw-thread for rapidly returning the reproducer to the beginning of the phonogram. In the present device the returning-screw is preferably not rotated by the phonograph-motor, as is usual, but by a hand-crank 1, the shaft of which is journaled in suitable bearings in the frame 2. This shaft is provided with a gear-wheel 3, engaging with wheel 4 on the return-screw 5, which preferably has a left-hand screw-thread. On the shaft, also, and having a frictional connection therewith are two arms or links 6 6', in which the screw 5 is supported. At the left end of screw 5 is a smooth wheel 7, on which spring 8 bears for the purpose of producing resistance to the rotation of said screw. On the link which carries this spring is mounted a projecting lug 9, which when the apparatus is at rest is below the extension 10 on the spring-pressed pivoted lever 11, but when the apparatus is

being used is raised above said extension and is held up thereby.

The arm or link 6' is provided with an extension 12, which in turn has an angle-extension 13, one end of which is beveled, as indicated at 14. A catch 15 normally engages with 13 and holds it and link 6' from movement. Said catch is rigidly mounted on an axle 16, at the opposite end of which is an arm 17, having a cam-shaped end extending into the coin-passage of the tube 18, which tube communicates with the coin-receiving slit 19. This is clearly shown in Fig. 3.

20 is a spring which normally holds 15 and 17 in their forward position.

21 is an angle-lever pivoted at 22 and having a bent end 23, extending into the coin-passage just below the cam-shaped end of 17. (See Fig. 3.) A plan of this lever is shown in Fig. 1. Under the outer end of said lever is a post 24, carried by the extension of the movable link 6'.

In Fig. 1, 25 indicates the ordinary feed-screw of a phonograph, driven, preferably, by an electric motor, and 26 is the feed-arm or other feeding device, connected with the reproducer in the ordinary manner. 27 is the phonograph-motor. (Shown diagrammatically.) 28 is the motor-battery. One terminal of the circuit is connected to a platinum or other conducting plate 29, which is mounted on but insulated from the frame, and the other terminal is connected to the pivoted lever 30. At the opposite end of the frame is a second pivoted lever 31. 32 is a rod connecting levers 30 and 31. 33 is an arm carried by the feed-arm and adapted to strike lever 31 as it moves toward the right and to strike lever 30 as it moves toward the left.

The apparatus above described is operated in the following manner: The feed-arm being at the extreme right of the screw, as indicated in Fig. 1, when it is desired to move said arm and the reproducer toward the left, a coin—for example, a nickel—is dropped into the coin-passage, and as it falls it strikes the cam-face of the pivoted arm 17, and the weight and size of the coin are such that it presses arm 17 and at the same time arm 15 toward the right. The coin comes to rest in position to hold the arm 17 in its retracted position, the coin resting on the end 23 of the arm 21. As the crank is turned by the hand the screw

is rotated, and since the catch 15 has been retracted the frictional connection between the shaft and the screw 5 is sufficient to bodily raise said screw against the force of gravity, bringing it into working contact with the feed-arm of the phonograph, whereby the reproducer will be moved toward the left by continued movement of the screw. As the screw is raised the lug 9 snapover the detent or holding device 10 and holds the screw in its elevated position. When the feed-arm reaches the limit of its motion toward the left, the extension 26' strikes the pivoted lever 11, moving it back against the force of its spring, thereby moving the projection 10 from under lug 9 and allowing the screw to resume its normal position. The upward movement of the screw above described raised post 24 against the outer end of the pivoted lever 21, thereby withdrawing the end 23 from the coin-passage, allowing the coin to fall into a suitable receptacle. When the screw is released and returns to its normal position, as above described, the beveled face 14 of the extension 13 rides over the inclined end of the catch 15 and the parts resume the position shown in Fig. 4. When the apparatus is in the position shown in Fig. 1, the motor-circuit is open. When the arm 33 reaches its extreme position toward the left, it carries lever 30 of the circuit-controller onto plate 29, closing the circuit. The circuit remains closed until the arm 33 moves back to its first position, when the circuit is again opened.

It will be evident that the parts may be varied in form to a considerable extent, and I do not confine myself to the exact construction described and shown.

Having thus set forth the invention, what I claim is—

1. The combination, with the feed-screw for advancing the reproducer of a phonograph, of a return-screw for the reproducer, normally out of engagement with the feed-arm, and a coin-operating device controlling the movement of said return-screw toward said feed-arm, substantially as described.

2. The combination of a return-screw for the reproducer of a phonograph, normally out of engagement with the feed-arm of the phonograph, a catch holding the return-screw, an arm controlling the catch and extending into the coin-passage, whereby the catch may be released by the insertion of a coin, substantially as described.

3. The combination, in an attachment for phonographs, of a return-screw for the phonograph-reproducer, and means for moving it toward the feed-arm of the reproducer, and means for turning the screw, a catch to hold said screw from movement toward the feed-arm, a coin-operated device for releasing the catch, and a trip for the coin, substantially as described.

4. In an attachment for phonographs, the combination of a shaft and means for turning it, a gear on the shaft, arms or links on

the shaft, a return-screw for the reproducer at the opposite end of the links, and a gear on said screw engaging the first-mentioned gear, substantially as described.

5. In an attachment for phonographs, the combination of a shaft and means for turning it, a gear on the shaft, arms or links on the shaft and having a yielding frictional connection therewith, a return-screw for the reproducer at the opposite end of the links, and a gear on said screw engaging with the first-mentioned gear, substantially as described.

6. In an attachment for phonographs, the combination of a shaft and means for turning it, a gear on the shaft, arms or links on the shaft and having a yielding frictional connection therewith, a return-screw for the reproducer at the opposite end of the links, a gear on said screw engaging with the first-mentioned gear, and a catch or detent to hold the screw from movement, substantially as described.

7. The combination, in an attachment for phonographs, with a shaft and means for turning it, of a return-screw for the phonograph-reproducer, means for transmitting motion from the shaft to the screw, and a frictional connection between said shaft and screw, substantially as described.

8. The combination, with the feed-screw of a phonograph and a feed-arm for the reproducer, of a return-screw normally out of range of the feed-arm, and means for moving the screw against the feed-arm and for turning the screw, substantially as described.

9. The combination of a return-screw for a phonograph-reproducer, normally out of range of the feed-arm of said reproducer, means for moving the screw against the feed-arm, means for turning the screw, and a detent for holding the screw in such elevated position, substantially as described.

10. The combination, with the feed-screw of a phonograph and a feed-arm for the reproducer, of a return-screw normally out of range of the feed-arm, means for moving the screw against the feed-arm, means for turning the screw, a detent for holding the screw in such elevated position, and a releasing device for the screw, operated at the close of the return movement of the reproducer, substantially as described.

11. The combination, with a feed-screw of a phonograph and a feed-arm for the reproducer, of a return-screw normally out of range of the feed-arm, means for moving the screw against the feed-arm and for turning the screw, and a circuit-controller moved to open and close the phonograph-motor circuit, substantially as described.

This specification signed and witnessed this 20th day of December, 1890.

JOHN F. OTT.

Witnesses:

CHARLES M. CATLIN,
RICH'D. N. DYER.

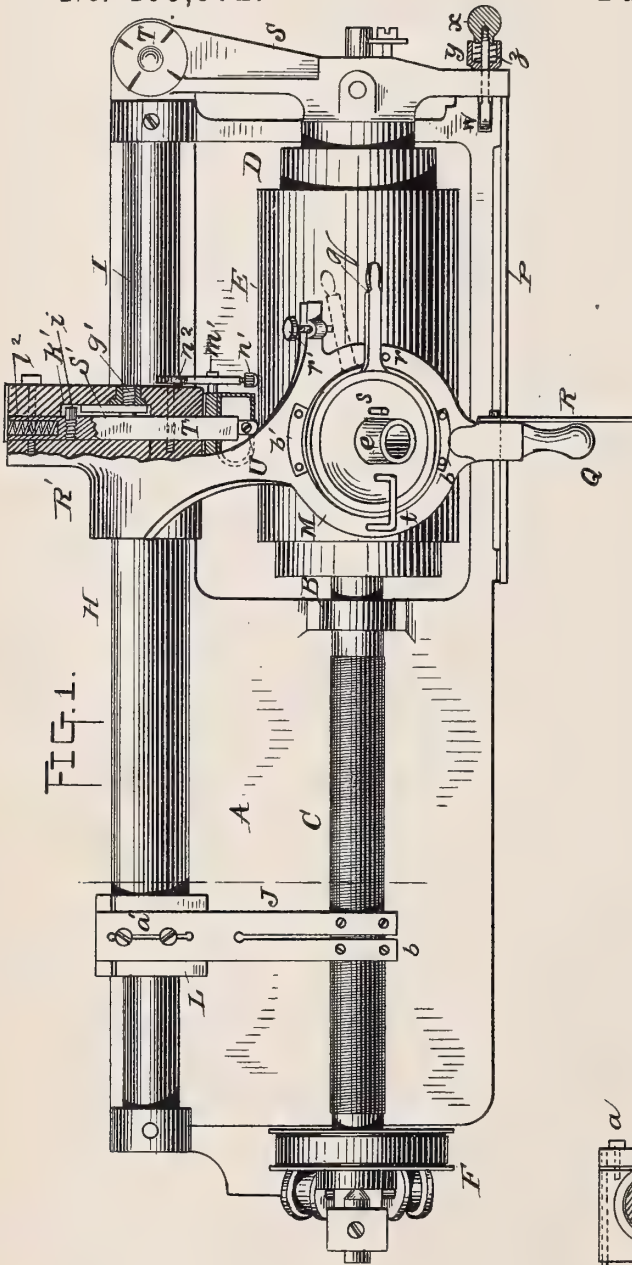
(No Model.)

2 Sheets—Sheet 1.

T. A. EDISON.
PHONOGRAPH.

No. 465,972.

Patented Dec. 29, 1891.

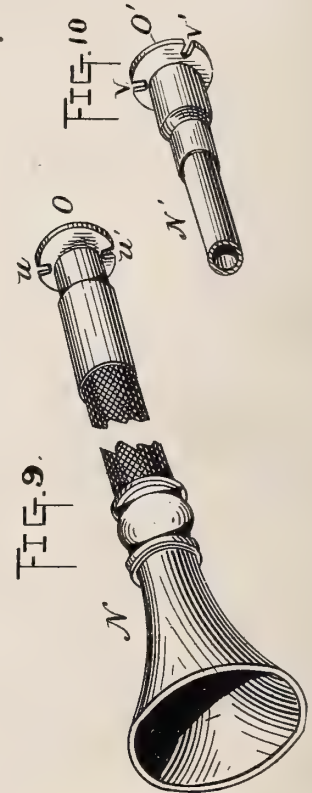


WITNESSES:
E. Rowland.
W. P. Ryan

FIG. 7



FIG. 8.



INVENTOR
Thomas A. Edison
BY *J. P. Sherry*
ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

T. A. EDISON.
PHONOGRAPH.

No. 465,972.

Patented Dec. 29, 1891.

FIG. 2.

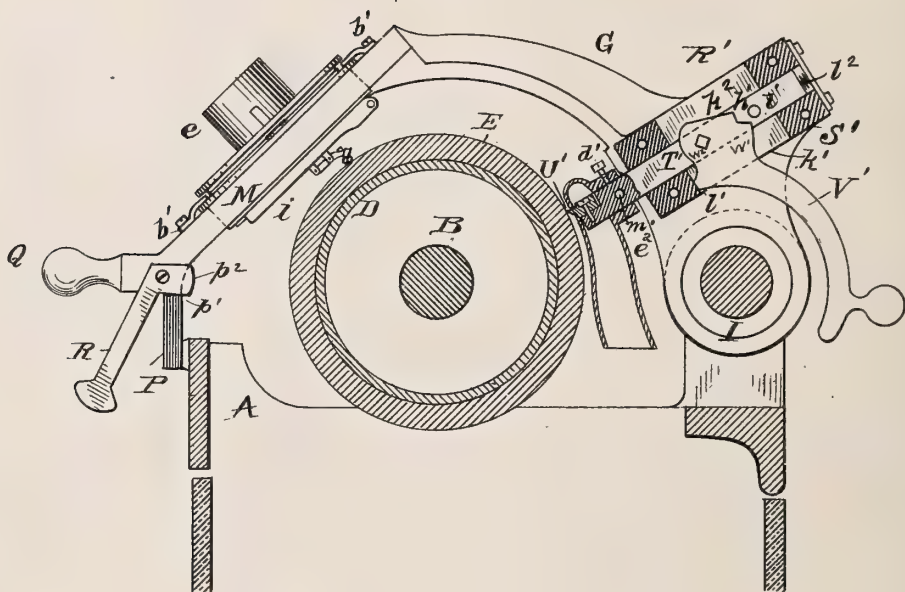


FIG. 3.

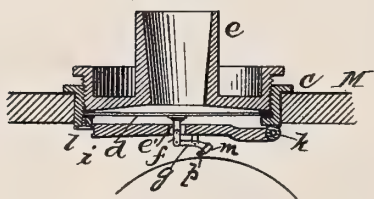


FIG. 4.

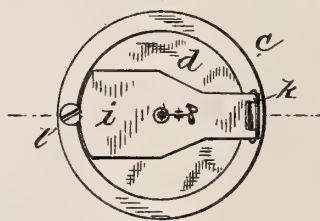


FIG. 5.

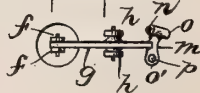
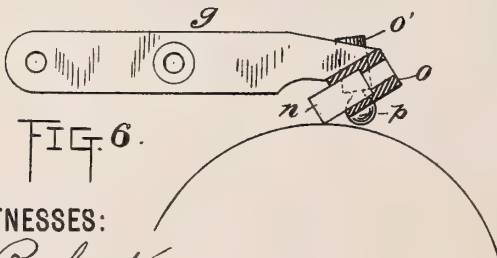


FIG. 6.



WITNESSES:

E. H. Rowland
W. H. Rizer

INVENTOR

Thomas A. Edison

BY

J. P. [Signature]
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 465,972, dated December 29, 1891.

Application filed November 18, 1889. Serial No. 330,789. (No model.)

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, (Case No. 847,) of which the following is a specification.

The object of my invention is to increase the simplicity in construction and operation of the phonograph by decreasing the number of parts of which the machine is composed, by lessening or avoiding the necessity for adjustment of the various parts in practice, and by increasing the convenience of manipulation of the machine. To this end I have made many changes in the machines described in my previous patents and applications, all with the objects of increased simplicity, convenience, and efficiency.

Heretofore I have employed separate diaphragms and holders therefor for the recording and reproducing points, these being held in the two eyes of a spectacle-frame, supported so that either could be swung into position over the phonogram-cylinder.

One feature of my invention is an improvement upon this arrangement; and it consists in attaching both the recording-point and the reproducing point to the same diaphragm, and so arranging the parts carrying such diaphragm that by a simple movement either the recording or the reproducing point may be placed in operative position. I so connect these parts with the diaphragm that no adjustment of the recording-point is required to give the right depth to the record, it being so arranged that it will itself assume the proper position on the record-surface. In addition to this feature, which is perhaps the most important of the improvements which constitute my present invention, I have further improved the construction and use of the turning-off tool for removing the record from the cylinder, the devices for supporting the frame which carries the recorder and reproducer and for raising the same off the phonogram surface, the feeding devices for moving the recorder and reproducer along the cylinder, the means for attachment of mouth-pieces or ear-tubes to the machine, and the means for holding the cylinder in place.

My invention is illustrated in the accompanying drawings.

Figure 1 is a top plan view of the phonograph embodying my invention, the motor or other means for revolving the cylinder being omitted and the holder for the turning-off tool being shown in longitudinal section; Fig. 2, a transverse vertical section of the machine; Fig. 3, a vertical section of the improved recorder and reproducer; Fig. 4, a bottom plan view of the same; Fig. 5, an enlarged bottom view of the recorder and reproducer without the diaphragm and frame; Fig. 6, an exaggerated side elevation and partial section of the recording and reproducing points; Fig. 7, a sectional view of my improved feeding device; Fig. 8, a bottom view of the same; Fig. 9, a perspective view of the mouth-tube used with the machine, and Fig. 10 a perspective view of a part of the ear-tube.

The machine is mounted upon a suitable base A.

B is the cylinder-shaft, provided with the feed-screw C.

D is the phonogram-cylinder, and E the phonogram-blank placed thereon.

The shaft B is rotated by a belt passing over the pulley F from a suitable motor or in any other convenient way. The rocking holding-arm G is carried by a sleeve H, sliding on the rod I, and such sleeve carries the traveler-arm or feeding device, which consists of a flat spring J, secured to a collar L, which is clamped upon the sleeve H by a screw *a*. The spring J is split at its outer end and carries two nut-sections *b b*, which engage the feed-screw C and are provided with fine threads corresponding to the thread C. This furnishes a more simple arrangement than that heretofore used by me. The flexibility of the spring holds the threads in engagement, and the spring being split a divided arm is formed, so that in case one nut-section fails to engage the feed-screw the other will, they being substantially independent. By means of the slot *a'* the feed-arm is adjusted in the manufacture of the machine to the right position.

The rocking arm G carries at its outer end a single circular receptacle M, instead of an adjustable spectacle-frame, as heretofore.

The receptacle M holds the combined recorder and reproducer, the external parts of which are made substantially as heretofore. The annular frame *c* is set in the receptacle M and adapted to turn therein, being held by two spring-clips *b' b'*, and such frame holds the diaphragm *d*, and the tube attachment *e* is screwed into said frame. Attached to the center of the diaphragm by cement or in any suitable manner is a post *e'*, from which extend two links *f*, connected with which is a lever *g*, which is also pivoted between lugs *h*, depending from the flat plate *i*, which is pivoted at *k* on the frame *c* and supported at its other end by the head of a small screw *l*.

Fixed upon the free end of the lever *g* is a cross-piece *m*, which carries the recording and reproducing points. These are preferably of the character shown and described in a previous application filed April 10, 1889, Serial No. 306,670, the recording-point having a circular gouging edge and the reproducing-point being in the form of a ball or sphere. The recording-point *n* is held in a sleeve *o* at an angle across one end of the cross-piece *m*, and the reproducing-point *p* is carried in a similar sleeve *o'*, extending directly from the face of said cross-piece.

It will be seen that by turning the collar *c* in the receptacle M either the recording-point or the reproducing-point will be brought into operative position on the phonogram-blank. As illustrated in Fig. 6, the recording-point is in contact with the surface and the reproducing-point is thrown off; but by turning the holder it will be seen that these positions will be reversed, the reproducing-point will be brought against the cylinder and the recording-point thrown out of contact therewith.

For convenience of manipulation I provide a handle *q* upon the outer ring of the holder and the receptacle M. I place a stop-pin *r* and an adjustable screw *r'* for limiting the movement of said handle and so determining the movement which may be given to the recording and reproducing points.

In order that the position of the reproducing-point may be adjusted laterally when necessary to bring it into the track of the record, I make the stop *r'* on one side adjustable. No other adjustment is required for either the recording or reproducing point, as will be explained. I place on the exterior of the diaphragm-holder a pin *s* and on the receptacle M, I place another bent pin *t*, which extends over the holder in the manner shown. I make the speaking-tube N, which fits upon the machine, with a plate O at its inner end, such plate having two notches *u u'* opposite each other, so that when the tube is placed on the machine with the pins *s t* in the position shown in Fig. 1 the notches *u u'* will fit over the said pins. The said pins are thus situated when the recording-point is on the cylinder, which is the time when the tube N is to be used; but when the parts are turned to bring the reproducing-point into operation

the pin *s* is moved away from its first position, so that the mouth-piece cannot be placed on the machine. I provide the ear-tube N' with a plate O' at its inner end, with notches *v v'* in such position as to engage the pins *s t* when the reproducer is in position. This device furnishes an indication of which point is on the cylinder, since only the proper tube for use at each time can be attached to the machine.

The outer end of the receptacle M rests upon a guide-rest P, as heretofore, and is provided, in addition to the handle Q for raising it off the record, with a pivoted handle R, having a cam-head, of which one side *p'* is square and the other side *p''* is curved. In lowering the receptacle upon the cylinder the handle R is held, together with the handle Q, so that the head is turned and the curved side *p''* reaches the guide-rest before the receptacle M and before the recording or reproducing point strikes the record. The handle R then being allowed to fall, the cam-head turns to its flat side and lets the point easily down upon the record. Raising the handle R, so as to turn the cam-head, lifts the receptacle sufficiently to raise the point off the record and disengage the nut-sections from the feed-screw, so that the forward movement of the recorder or reproducer is stopped, so as to allow the parts to be slid back to the starting position.

No adjustment for any part is required at the guide-rest, as heretofore, by reason of the provision of the weight *i*. Such weight is made such as by its pressure on the recording-point to cause the same to enter the record material to the desired depth. The material used is preferably of a hard and brittle nature. The resistance to the entrance into the material of the gouging recording-point increases the farther it enters, and when it reaches the desired depth such resistance becomes so great as to lift the weight, and the point will penetrate no farther. This is the same no matter how the size of the cylinder may be decreased by turning it off, of course within the limits for which the machine is constructed. The reproducing-point will of course go to the bottom of the record, it being adjusted laterally, if necessary, by screw *r'*. The weight *i* also serves as a retarding device, such as is described in a prior patent permitting the sound-vibrations to be transmitted to and from the diaphragm, but taking up any movements due to irregularities in the shape of the cylinder and preventing such movements from affecting the diaphragm.

By arranging the recording and reproducing points as described I am enabled to place the knife which I employ for turning off the surface of the cylinder to remove a record at a distance from the recording and reproducing points. I place it at the rear portion of the rocking holding-arm, and I arrange it so that the depth of the cut may be precisely

determined. I place the knife at the end of a stem which is constantly held forward by a spring, and I provide an adjustable stop engaging the cylinder surface, which enables the distance to which the knife is pressed forward to be altered according to the size of the cylinder, and which is swung off the cylinder by the turning movement thereof. I provide, also, a simple device for moving the knife off the cylinder and for locking the knife against the cylinder and away from it, and I so arrange this that the throwing back of the rocking holding-arm will trip such device and move the knife back, so that when the arm is lowered again to bring the recording-point into position the knife will be off the surface.

The rocking holding-arm has a rearwardly-extending projection R' , one side of which is flat, and to this is secured by screws a square guide S' , in which slides a square stem T' , which carries at its end the knife U' . Secured by a set-screw d' to said stem is the metal chute e^2 for conveying the shavings from the knife, the stem passing through such chute and projecting through a small hole against the cylinder, so that the material removed by the knife passes through the hole into the chute and is conveyed away from the cylinder. Pivoted on a screw g' , which passes through the guide-wall is a lever V' , which passes out through a slot k' in said guide, and whose head plays in said slot and in slot k^2 opposite it. The head of said lever has a notch h' to engage a pin i' on the stem T' and a projection l' arranged to strike the end of the slot k' . The outer end of the stem T' is cored and receives a light spring l^2 , which presses the stem and knife forward. The lever V' is of such length as to strike the back of the machine when the rocking holding-arm is thrown back.

Pivoted loosely at the side of the stem T' , between the chute and the end of the guide, is a pin m' , having a head n' adjustable longitudinally on said pin, the other end n^2 of said pin being weighted.

In operation, when it is desired to use the turning-off tool, the rocking holding-arm is lowered upon the cylinder, the head n' being adjusted so as to cause the knife to enter the cylinder to the requisite depth, the spring forcing the knife forward. The lever is then lowered into the position shown in Fig. 1, and this gives the screw a turn and sets it against the stem T' , so that such stem is held in position and prevented from moving in either direction. The revolution of the cylinder moves the head of the loose pin away from it, so that it will not injure the surface. When the turning-off operation is concluded, the handle may be tripped by hand, if desired, the same being thrown back, so as to loosen the screw, and the notch engages the pin and moves the stem T' back. The notch passes over the stem so that the edge w' rests against the pin and the edge w^2 against the lower end

of the slot k' , whereby the knife is held back and does not touch the cylinder when the rocking holding-arm is again lowered. Instead of tripping the handle by hand, if the rocking holding-arm is thrown all the way back the end of the handle will strike the back of the machine and be moved thereby, so as to lock the knife in its rearward position, as explained. During the turning-off operation the diaphragm-handle may be turned to its middle position, so that both the recording-point and the reproducing-point will be removed from the surface, or of course, if desired, a new record may be made while the old one is being removed.

Another improvement is in the clamping device for the swinging arm at the end of the cylinder. This consists in the use of a spring for holding said arm in place. The arm is represented at S , being pivoted at T , and the clamping device is pivoted, as heretofore, at w and enters from below a slot in the end of the arm S . The head x for moving the clamping device has heretofore been made adjustable, so as to be screwed up against the arm S . I now provide the clamping device with a sliding sleeve y , containing a stationary spring z , which, when the clamping device is raised, holds the sleeve y against the arm S and locks the parts without any further movement on the part of the operator.

What I claim is--

1. In a phonograph, the combination, with a diaphragm, of a recording-point and a separate reproducing-point connected therewith and adapted to be brought alternately into operative relation with the same surface, substantially as set forth.

2. In a phonograph, the combination, with a diaphragm, of a recording-point and a separate reproducing-point connected with said diaphragm on the same side thereof, substantially as set forth.

3. In a phonograph, the combination, with a diaphragm, of a recording-point and a reproducing-point connected therewith and means for moving said points so as to bring either of them into operative position with relation to the same surface, substantially as set forth.

4. In a phonograph, the combination of a diaphragm, an arm connected therewith, and a recording-point and reproducing-point attached to said arm at different angles, substantially as set forth.

5. In a phonograph, the combination of a diaphragm supported so as to have a turning movement and a recording-point and reproducing-point carried thereby at different angles, substantially as described.

6. In a phonograph, the combination of a diaphragm set in a movable frame and a recording-point and a reproducing-point connected therewith and adapted by the movement of said frame to be brought alternately into operative relation to the same surface, substantially as set forth.

7. In a phonograph, the combination of a receptacle, a diaphragm held movably in said receptacle, a handle connected with said diaphragm, and a recording-point and a reproducing-point carried by said diaphragm, substantially as set forth.
8. In a phonograph, the combination of a diaphragm, an arm pivotally connected with said diaphragm, a cross-piece on said arm, and a recording-point and reproducing-point carried at the ends of said cross-piece, respectively, substantially as set forth.
9. In a phonograph, the combination of a diaphragm, an arm pivotally connected with said diaphragm, a cross-piece on said arm, a recording-point held at an angle across one end of said cross piece, and a reproducing-point extending from the face of said cross-piece at its other end, substantially as set forth.
10. In a phonograph, the combination of the diaphragm, the recording and reproducing points connected with said diaphragm, and a retarding device common to both points, substantially as set forth.
11. In a phonograph, the combination of a diaphragm, a lever connected therewith, separate recording and reproducing points carried by said lever, and a retarding device for said lever, substantially as set forth.
12. In a phonograph, the combination of a diaphragm, a recording-point and a reproducing-point connected therewith, and a loose weight pressing upon said points, substantially as set forth.
13. In a phonograph, the combination of a diaphragm, a lever connected therewith, a recording-point and a reproducing-point attached to said lever, and a loose weight pressing upon said lever, substantially as set forth.
14. In a phonograph, the combination, with the turning diaphragm carrying both the recorder and the reproducer, of the guides for determining the position of the speaking-tube and ear-tube, substantially as set forth.
15. In a phonograph, the combination of the receptacle, the annular frame turning therein, the diaphragm held by said frame, the recording and reproducing points connected with the diaphragm, the guide-pin on the turning frame, the guide-pin on the stationary receptacle, and the speaking-tube and ear-tube having notches differently situated, substantially as set forth.
16. In a phonograph, the combination of the feed-screw, the movable part carrying the recorder and reproducer, and the divided feeding-arm engaging said feed-screw, substantially as set forth.
17. In a phonograph, the combination of the feed-screw, the movable part carrying the recorder and reproducer, and the split spring carrying the nut-sections engaging said feed-screw, substantially as set forth.
18. In a phonograph, the combination of the pivoted holder carrying the recorder and reproducer, the guide-rest, and the pivoted handle for said holder, having a cam-head, substantially as set forth.
19. In a phonograph, the combination of the rocking holding-arm carrying the recorder and reproducer, the feed-screw, the traveler-arm connected with the rocking holding-arm and engaging said feed-screw, and the pivoted handle for the rocking holding-arm, having a cam-head engaging said guide-rest, substantially as set forth.
20. In a phonograph, the combination of the turning-off knife, the guide in which said knife slides, and the spiral spring within said guide behind said knife for pressing said knife forward, substantially as set forth.
21. In a phonograph, the turning-off knife, in combination with a spring for pressing the same forward and the adjustable pivoted stop for limiting the forward movement, substantially as set forth.
22. In a phonograph, the combination of the turning-off knife, a spring for pressing the same forward, and a clamp for locking the same in position, substantially as set forth.
23. In a phonograph, the combination of the guide, the knife-stem sliding in said guide, a clamp for locking said stem in any position, and a handle for moving said clamp, substantially as set forth.
24. In a phonograph, the combination of the guide, the knife-stem sliding therein, a clamp for holding said stem in position, and means for releasing said clamp, operated by a movement of the rocking holding-arm, substantially as set forth.
25. In a phonograph, the combination of the rocking holding-arm, the turning-off knife sliding through a guide on said arm, the clamp for locking said knife, and a projection from said clamp, adapted to strike the back of the machine when the arm is thrown back, substantially as set forth.
26. In a phonograph, the combination of the slotted guide, the knife-stem sliding therein, and the locking and releasing handle for said stem, projecting through said slot, substantially as set forth.
27. In a phonograph, the combination of the slotted guide, the knife-stem sliding therein, and the pivoted handle having a cam-head for moving said stem, substantially as set forth.
28. In a phonograph, the combination of the guide, the knife-stem sliding therein, the set-screw adapted to set against the stem, and the handle pivoted on said screw for moving said stem, substantially as set forth.
29. In a phonograph, the combination, with the turning-off knife, of the conveying-chute supported upon said knife, substantially as set forth.
30. In a phonograph, the combination of a conveying-chute and a turning-off knife passing through said chute, and with its edge projecting through an aperture in said chute, substantially as set forth.
31. In a phonograph, the combination of the

movable diaphragm carrying both the recording-point and the reproducing-point, and the stops limiting the movement of said diaphragm, substantially as set forth.

5 32. In a phonograph, the combination of the movable diaphragm carrying both the recording-point and the reproducing-point, and the stops limiting the movement of said diaphragm, the stop which controls the movement for throwing in the reproducing-point
15 being adjustable, substantially as set forth.

33. In a phonograph, the combination of the recording-point and reproducing-point carried by the same diaphragm, means for moving said points so as to bring either of them
15 into operative position, and means for adjusting the position of the reproducing-point laterally to the record, substantially as set forth.

34. In a phonograph, the combination, with
20 the movable diaphragm, and the holder carrying the recording-point and reproducing-point,

of the spring-clips for holding the same in place, substantially as set forth.

35. In a phonograph, the combination of a gouging recording-point and a spherical reproducing-point carried by the same diaphragm, substantially as set forth. 25

36. In a phonograph, the combination of a cutting recording-point and a blunt reproducing-point carried by the same diaphragm, substantially as set forth. 30

37. In a phonograph, the combination, with the swinging arm for holding the cylinder in place, of the spring-lock for said arm, substantially as set forth. 35

This specification signed and witnessed this 14th day of November, 1889.

THOS. A. EDISON.

Witnesses:

D. H. DRISCOLL,
WILLIAM PELZER.

(No Model.)

2 Sheets—Sheet 1.

J. H. WHITE.
PHONOGRAPH.

No. 467,530.

Patented Jan. 26, 1892.

Fig. 1.

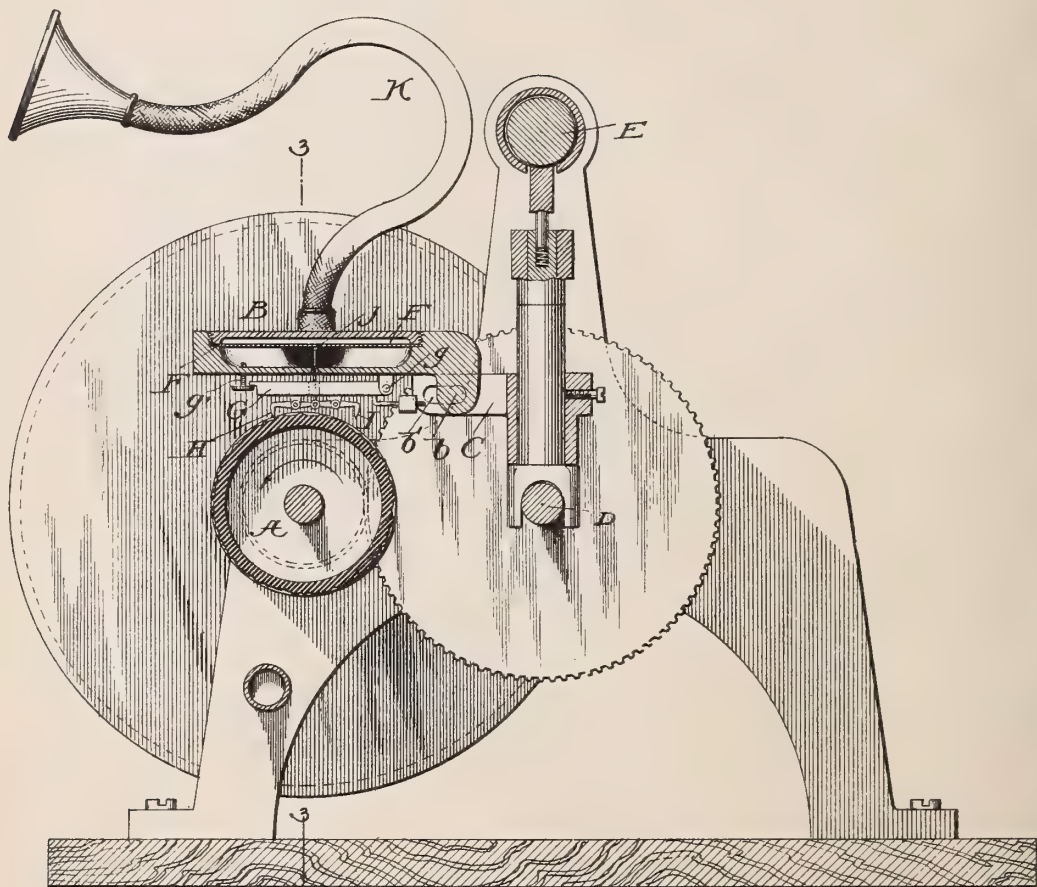
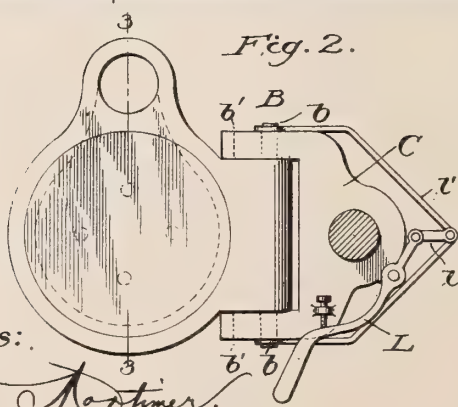


Fig. 2.

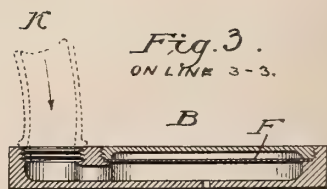


Witnesses:

W. W. Mortimer.

N. R. Kenned.

Fig. 3.
ON LINE 3-3.



Inventor:

Jno. H. White
By his Atty
Phil. T. Dodge.

(No Model.)

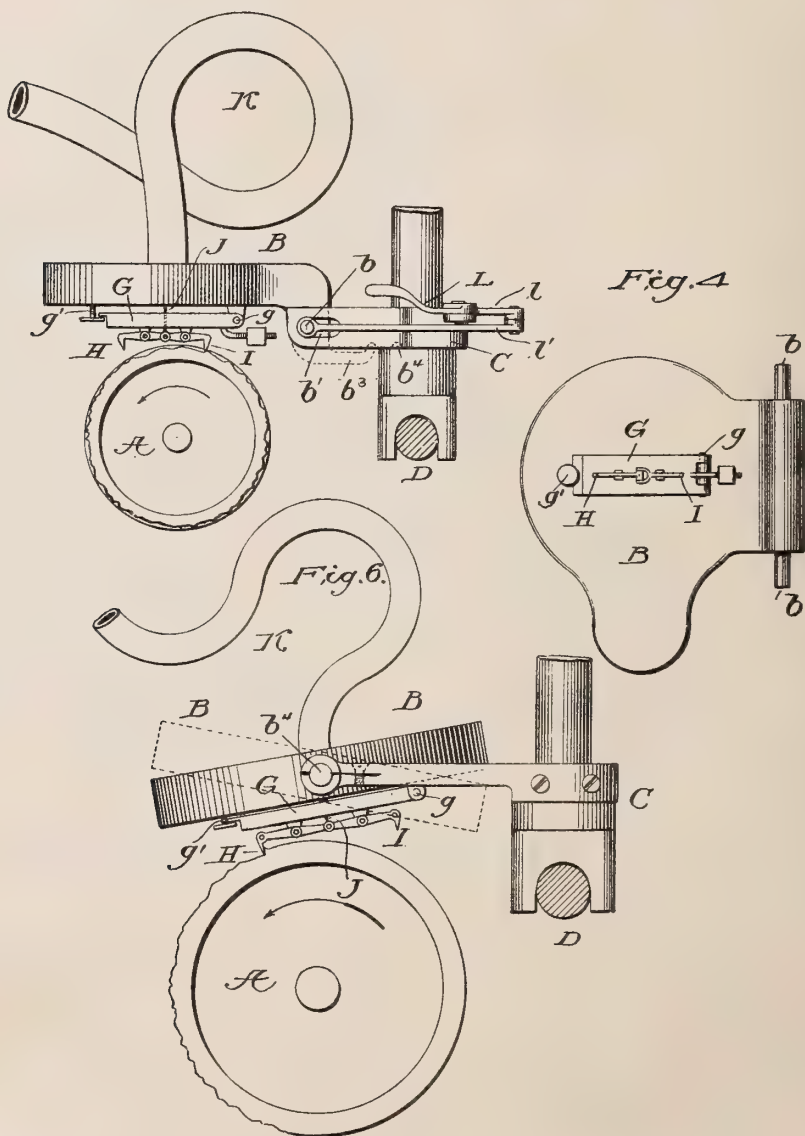
2 Sheets—Sheet 2.

J. H. WHITE.
PHONOGRAPH.

No. 467,530.

Patented Jan. 26, 1892.

Fig. 5.



Witnesses:

N. N. Mortimer.
N. R. Kennedy.

Inventor:

Jno. W. White
 Pay his Atty
 Phil. T. Dodge

UNITED STATES PATENT OFFICE.

JOHN H. WHITE, OF WASHINGTON, DISTRICT OF COLUMBIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 467,530, dated January 26, 1892.

Application filed June 4, 1891. Serial No. 395,065. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. WHITE, of Washington, District of Columbia, have invented a new and useful Improvement in Phonographs, of which the following is a specification.

This invention relates to that class of instruments known as "phonographs" or "graphophones," wherein the sound-waves impinge upon and operate a vibratory diaphragm, which in turn operates a style acting to produce a record-groove of variable depth in a wax-like surface, the record thus produced being in turn used to set in motion a style or other equivalent device actuating a diaphragm, which reproduces the recorded sounds.

My first improvement has reference to the connections between the recording-style and the diaphragm, and is intended to secure the production of a more faithful record and a correspondingly accurate reproduction of the sounds free from the usual nasal and metallic tones. In most of the successful instruments now in use the lever or style acting at one end on the record-cylinder and connected at the other end with the overlying diaphragm is mounted at its middle on a pivot carried by a gravitating arm or weight, so that the style and its fulcrum may rise and fall bodily. The sound-waves impinge on the top of the diaphragm, depressing the same, and thereby lowering the heel end of the underlying style toward the cylinder in the same direction that the gravitating arm tends to carry the fulcrum. The result is that the fulcrum offers a diminishing resistance when loud or violent sounds suddenly depress the diaphragm, so that the style produces a record of less than the proper depth. In order to overcome this defect, I so arrange the parts that the sound-waves are directed against the inner or under side of the diaphragm and caused to urge the heel end of the style upward in opposition to the depressing influence of the gravitating arm, thus bringing the weight and inertia of the arm effectively into play to insure the cutting of the record by the style to the proper depth, while at the same time the capacity of the parts to yield under excessive strains is retained.

In the drawings I have shown my improvement embodied in the preferred form; but it is evident that the details may be varied, provided the essential feature—that of having the sound-waves act to move the heel end of the style in opposition to the tendency of the yielding support—is retained.

Another part of my invention consists in combining with the gravitating style-supporting arm an adjustable counter-weight, to the end that the downward pressure exerted upon the style may be modified as circumstances demand.

Another part of my invention relates, particularly, to those instruments in which a recording-style and a reproducing-style are connected with one diaphragm and the parts so arranged as to admit of either style being brought into operative relation to the record-surface at will. Heretofore it has been the custom to arrange the styles in divergent lines and to throw them into and out of action by a lateral motion secured by rotating the diaphragm-support. I employ styles in the form of levers and arrange the two styles end to end—that is to say, in the same vertical plane transverse to the axis of the record-cylinder—and I throw one into and the other out of action by moving them in said plane either with a sliding or with a rocking movement, thus doing away with the necessity for a lateral adjustment and with the many evils attending the same.

My invention also includes various minor improvements, which will be hereinafter explained.

For purposes of illustration I have represented the several improvements as embodied in a graphophone of the construction represented in Letters Patent of the United States No. 429,827, issued to me on the 10th day of June, 1890.

With the exception of the improvements herein described and constituting the subject of the present invention the instrument may be constructed in all respects in accordance with said patent.

In the accompanying drawings, Figure 1 represents a vertical cross-section through the instrument with the recording-style in operative position. Fig. 2 is a top plan view of

the diaphragm-frame and attendant parts. Fig. 3 is a transverse section of the diaphragm and its supporting-frame on the line 33, Figs. 1 and 2. Fig. 4 is a bottom plan view of the diaphragm-frame and its adjuncts. Fig. 5 is a side elevation of the principal parts with the reproducing-style in operative position. Fig. 6 is a side view of a modification.

Referring to the drawings, A represents the horizontal record-cylinder, having a wax-like surface and mounted to revolve in the direction indicated by the arrows.

B is the diaphragm-supporting frame, jointed or otherwise attached to the supporting-carriage C, which is arranged to travel slowly under the influence of the operating-screw E along the guide D, lying parallel with the record-cylinder, whereby the recording and reproducing styles are caused to traverse the cylinder from one end to the other, as in existing instruments.

The diaphragm-frame B, as shown in the drawings, is connected to the carriage C by a horizontal pivot-pin *b*, extending through horizontal slots *b'*, so that the frame may be turned upward out of action or moved, when in operative position, forward and backward in a direction at right angles to the axis of the record-cylinder, and this in order to throw one or the other of the styles into operative relation to the cylinder, as will presently appear. The diaphragm-frame is supported and carried wholly by the carriage, so that its weight is not received to any extent upon the cylinder.

The diaphragm F, of sheet metal or other suitable material, is confined at its periphery within the frame, so that its central portion may vibrate freely, as usual. The frame is closed on the underside, so as to form a chamber beneath the diaphragm, this chamber being extended at one edge beyond the diaphragm and provided with an opening to receive the end of the sound-conducting tube K, so that the sound-waves are projected beneath and caused to act on the under side of the diaphragm with a lifting effect, urging the same from the record-cylinder instead of toward the cylinder, as usual.

To the under side of the diaphragm-frame there is connected by a horizontal pivot *g* a gravitating arm or plate G, the falling motion of which is limited at its free end by the adjustable stop-screw *g'*, seated in the frame. H represents the recording style or lever, mounted midway of its length on a horizontal pivot seated in ears depending from the plate G, one end of the style being turned downward and suitably fashioned to form the record in the surface of the cylinder, while the opposite or heel end is connected with the diaphragm by a thread or wire J. It will be observed that under this arrangement sound-waves directed through the tube into the chamber beneath the diaphragm tend to force the latter upward and that the rising diaphragm acts in turn to lift

the heel end of the recording-style H and force its opposite end more deeply into the record-surface, so as to increase the depth of the record-groove. It is to be particularly noticed that this elevation of the heel end of the style to force its active end downward is in opposition to the downward pressure of the arm G, so that the sudden upward pull on the heel end of the style is in opposition to the weight of the arm, the diaphragm tending to move the arm in one direction, while the weight tends to move it in the other. Thus it is that I am enabled the more effectively to utilize the weight and inertia of the arm to keep the style down properly to its work.

The foregoing parts constitute a complete and operative recording apparatus, and may be used in an instrument having an entirely independent reproducing mechanism or used in connection with reproducing devices such as hereinafter described. It is to be understood, however, that so far as the action of the gravitating arm upon the recording-style is concerned it is not in any manner dependent upon the construction or operation of the reproducing devices.

It is to be noticed that under my arrangement the connection J between the diaphragm and the style is kept under tension. This permits the use of a thread or other flexible connection, which is found in practice to give better results than a wire or other rigid connection, although the latter may of course be employed.

I represents the reproducing-style in the form of a lever pivoted midway of its length to ears in the under side of the gravitating arm, one end being suitably adapted to traverse the record-groove, while the opposite end is attached to the thread or wire J, leading to the diaphragm, the one connection serving, as will be seen, to operate the two styles. I prefer to joint the heel ends of the two styles together, as represented in Fig. 4, one being forked and carrying a horizontal pivot, which passes through a slot in the end of the other. The two styles are arranged, as will be seen, end to end in line transversely of the cylinder—that is to say, in a vertical plane lying at right angles to the axis of the cylinder. Under this arrangement the horizontal sliding motion of the diaphragm-frame, before referred to, as allowed by the slots *b'*, serves to carry the end of one style out of contact with the record-cylinder as the other is brought into contact therewith.

When the frame is slid back, as shown in Fig. 1, the record-style is in operative position, and when it is moved forward, as in Fig. 5, the reproducing-style is in operative position. This movement of the frame to throw one or the other of the styles into action may be secured in any suitable manner.

In Figs. 2 and 5, L represents a shifting-lever pivoted on the carriage C and connected by link *l* to a stirrup *l'*, which engages the two ends of the pivot *b*, so that by moving the lever

L to and fro the diaphragm-frame is moved back and forth.

Another serviceable construction which avoids the necessity for using the lever and stirrup is indicated by dotted lines in Fig. 5, in which b^3 is a rigid arm extending downward and rearward from the diaphragm-frame, with an uprising lip at its extremity to engage in notches b^4 on the under side of the carriage C, so as to hold the frame in either its forward or backward position, as demanded, the frame being unlocked by lifting its forward edge so as to throw the arm b^3 out of engagement while the frame is being shifted.

Instead of sliding the frame to and fro to throw the respective styles into and out of action it may be connected to the carriage, as shown in Fig. 6, by horizontal journals b^4 , which admit of its being given a rocking motion, as indicated by dotted lines, in order to throw the end of one style downward against the record-cylinder and at the same time carry the end of the other upward out of contact therewith.

Having thus described my invention, what I claim is—

1. In a sound-recording mechanism and in combination with a record-receiving body, a pivoted style acting on the record-body, a yielding style-supporting arm tending to move the style toward the record-surface, a diaphragm connected to the style, and means for directing the sound waves or impulses against the diaphragm in such direction that it tends to urge the style toward the record in opposition to the tendency of the yielding arm.

2. In a sound-recording mechanism and in combination with a record-receiving surface, the diaphragm, the gravitating arm, the style pivoted to said arm and connected at one end to the diaphragm, and means for directing the sound-waves against the under side of the diaphragm.

3. In a phonograph, the combination of a record-cylinder, a carriage movable in the direction of the length of the cylinder, a dia-

phragm-supporting frame connected to and sustained by the carriage and having an air-confining chamber beneath the diaphragm, means for directing the sound-waves into said chamber, and a recording-style connected with the diaphragm.

4. In a phonograph and in combination with the diaphragm, the pivoted style connected therewith, the gravitating style-supporting arm, and an adjustable weight or counterpoise.

5. In a phonograph, the combination of a record-surface, a diaphragm, and a recording and a reproducing style arranged end to end in the same vertical plane.

6. In a phonograph and in combination with a record-surface, a diaphragm-supporting frame movable in a vertical plane, and a recording and a reproducing style, both sustained from said frame and arranged to be thrown alternately into and out of action by said movement of the frame.

7. In a phonograph, the record-cylinder, in combination with the diaphragm, the recording and reproducing styles connected with the diaphragm, and means for moving said parts in a path transverse to the axis of the cylinder, whereby either style may be thrown into action and the other thrown out of action at will.

8. In a phonograph, the combination, with a diaphragm to actuate the same, of the two pivoted styles jointed together at one end, substantially as described and shown.

9. In a phonograph, the combination, with the carriage, of the diaphragm-supporting frame connected thereto by a sliding joint, and the lever and link mounted on the carriage for the purpose of adjusting the diaphragm-frame.

In testimony whereof I hereunto set my hand, this 19th day of May, 1891, in the presence of two attesting witnesses.

JNO. H. WHITE.

Witnesses:

W. R. KENNEDY,
P. T. DODGE.

467530

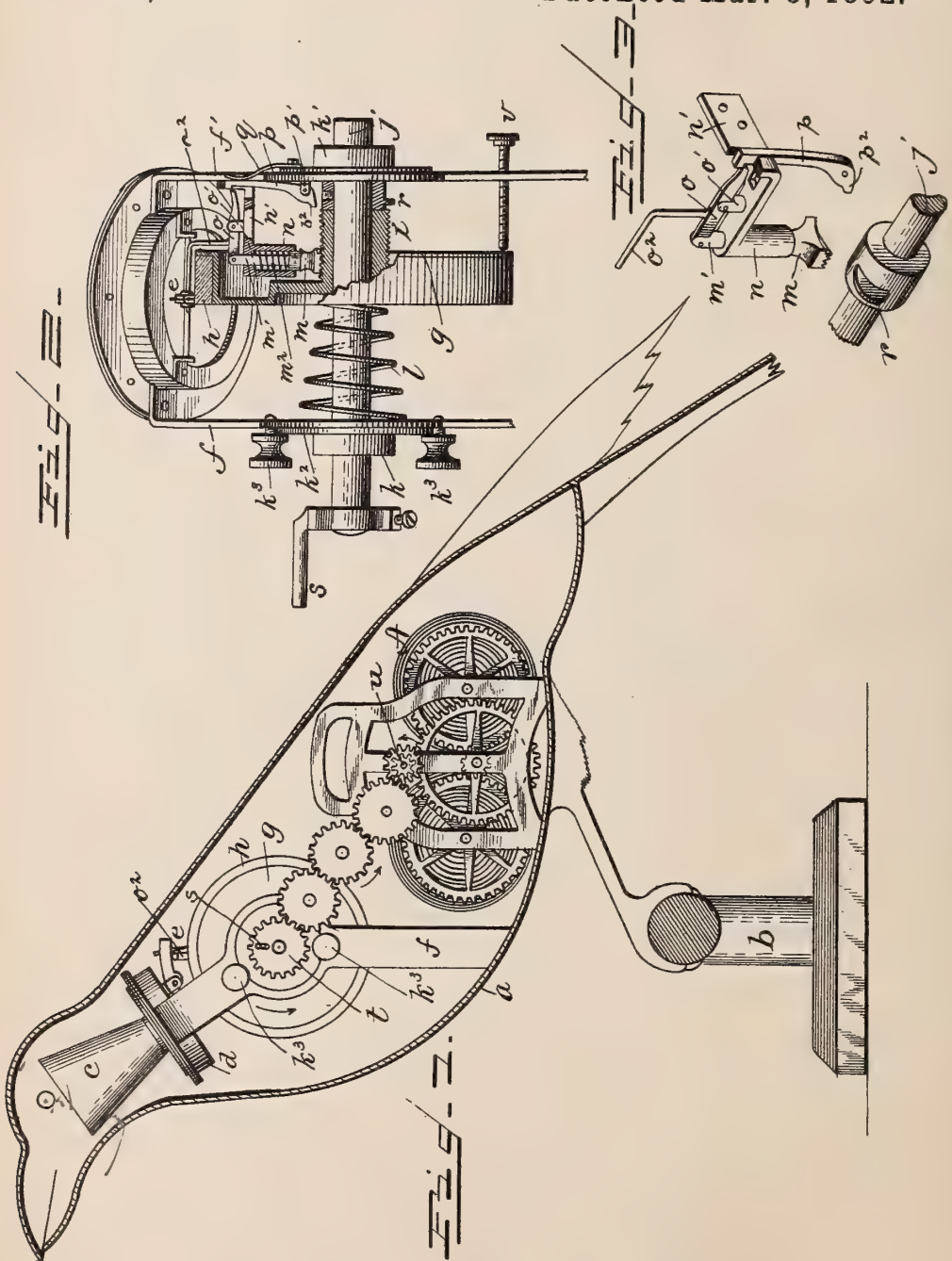
(No Model.)

2 Sheets—Sheet 1.

F. M. & J. A. E. CRISWELL.
PHONOGRAPH.

No. 470,477.

Patented Mar. 8, 1892.



WITNESSES

F. L. Ourand
E. Kincaid.

INVENTORS.

Francis M. Criswell,
James A. C. Criswell,
by *Wm. F. Lincoln*
their Attorney

(No Model.)

2 Sheets—Sheet 2.

F. M. & J. A. E. CRISWELL.
PHONOGRAPH.

No. 470,477.

Patented Mar. 8, 1892.

Fig. 5.

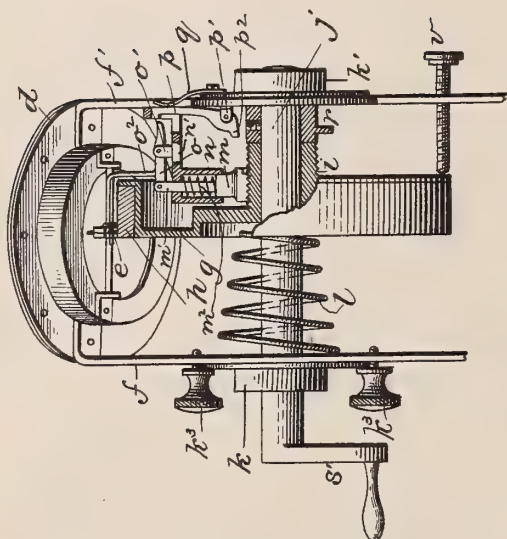


Fig. 4.

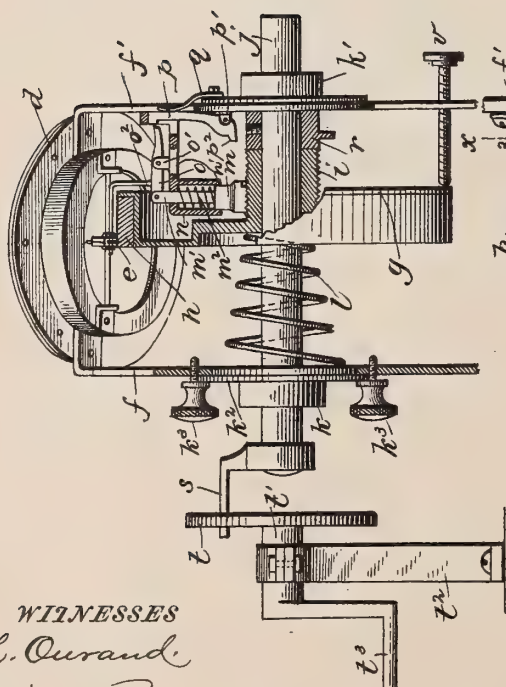


Fig. 7.

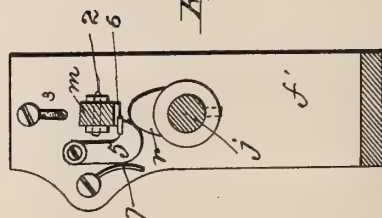
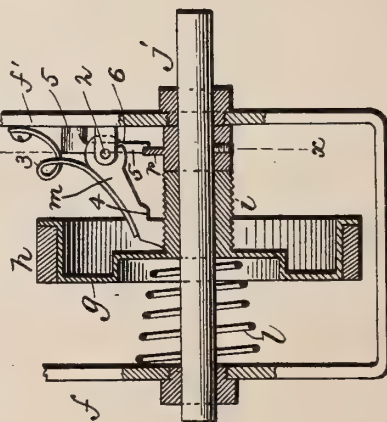


Fig. 6.



WITNESSES
F. L. Ourand.
Ed. Kinzel.

INVENTORS.
Francis M. Criswell.
James A. E. Criswell.
By Wm. H. Finckel
their Attorney.

UNITED STATES PATENT OFFICE.

FRANCIS M. CRISWELL, OF WASHINGTON, DISTRICT OF COLUMBIA, AND
JAMES A. E. CRISWELL, OF BROOKLYN, NEW YORK; SAID JAMES A.
E. CRISWELL ASSIGNOR TO SAID FRANCIS M. CRISWELL.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 470,477, dated March 8, 1892.

Application filed June 16, 1891. Serial No. 396,517. (No model.)

To all whom it may concern:

Be it known that we, FRANCIS M. CRISWELL, a citizen of the United States, residing at Washington, in the District of Columbia, and
5 JAMES A. E. CRISWELL, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Phonographs, of which the following is a full,
10 clear, and exact description.

The object of our invention is to produce a continuously and automatically repeating phonograph.

In carrying out our invention we have constructed the record-cylinder with mechanism whereby when it has made its full lateral travel it is returned automatically to the starting-point and its revolution and progressive lateral motion continued indefinitely
20 in accordance with the length of run or motion of the motor.

We will describe the principle of our invention first and the best mode in which we have contemplated applying that principle and
25 will then particularly point out and distinctly claim the part or improvement which we claim as our invention.

In the accompanying drawings, in the several figures of which like parts are similarly designated, Figure 1 is a sectional elevation illustrating the application of our invention to the image of a crow. Fig. 2 is a front elevation, partly in section, of the phonograph; and Fig. 3 shows in perspective portions of the repeating mechanism. Fig. 4 is a sectional elevation similar to Fig. 2, showing our phonograph arranged to be worked by hand. Fig. 5 is a similar section showing our repeating mechanism applied to the Edison and
30 kindred phonographs. Fig. 6 is a sectional elevation showing a modified form of our repeating mechanism; and Fig. 7 is a vertical cross-section taken, essentially, in the plane of line *xx* of Fig. 6, but showing the foot *m*
45 to be in engagement with the latch 5.

One of the inventors of this invention has adopted for use in advertising his manufacture of a proprietary remedy for corns a stuffed crow, or a representation of a crow,
50 and to add to the attractiveness of such ad-

vertising device we have combined therewith a phonograph; but while our phonograph has this special adaptation we do not wish to be understood as limiting our invention thereto.

The letter *a* designates the representation 55 of a hollow crow, which may be made of metal, papier-maché, or other material, and *b* is a perch or pedestal therefor. In the interior of the image of the crow is arranged the phonograph and a motor therefor, the latter in the illustration given being a clock-movement, although, obviously, other sources of power may be employed and located elsewhere than within the image.

In the phonograph *c* is the resonator, *d* the 65 vibrating diaphragm-chamber, and *e* the stylus.

ff' are standards for supporting the diaphragm-chamber and other working parts of the phonograph. 70

g is the record cylinder or drum, and *h* the record-surface thereon. The record-cylinder is provided with a hub *i*, projecting laterally from one side, and this cylinder is fixed to a shaft *j*, which is adapted to slide in the direction 75 of its length in bearings *k* and *k'*, arranged in the standards *f* and *f'*. The bearing *k* is provided with a circular flange *k²*, which is fitted into a corresponding opening in the standard *f* and removably held therein on one side by 80 screws *k³* and on the other by the cylinder-spring *l*, which bears against it. The other bearing *k'* may be fixed. The removable bearing admits of the ready removal of the cylinder, its shaft, and the spring. The hub *i* is provided with a screw-thread on its outer surface, and this screw-thread is engaged by a correspondingly-screw-threaded foot *m*, which is fixed in relation to the frame, so that as the cylinder is revolved the engagement of the screw-thread of the foot with the screw-thread of the hub will cause such cylinder and its shaft to move laterally from the foot. This foot has a stem *m'* arranged in a tubular socket *n'* and is provided with a spring *m²*, which 95 tends normally to force the foot into engagement with the hub. The socket *n'* is secured to the standard *f'* by a bracket *n*. The stem *m'* of the foot *m* is jointed to a lever *o*, which in turn is fulcrumed to a post *o'* on the bracket 100

n , and the other end of this lever is engaged by a latch p at certain periods, and this latch is held up to the lever by a spring q . Normally the latch and lever are disengaged.

5 The latch p is pivoted at its lower end to a post p' on the standard f' , and said latch terminates in a toe or tappet p^2 , which extends therefrom in the direction of the length of the shaft j and toward the record-cylinder.
10 A cam r is fixed to the shaft j next to the hub i and is adapted to engage and lift the foot m and the toe or tappet p^2 , as will be described. The lever o is provided with an arm o^2 to lift the stylus e in the return movement
15 of the record-cylinder.

In the accompanying illustration of our invention the phonograph-cylinder is arranged to be rotated by a clock-movement A , and for this purpose the shaft j is provided with a
20 crank s on one end, and this crank engages a slotted pinion t , which is in train with the main shaft u of the clock-movement. The crank s is as long as the length of movement of the shaft j , so as always to be in engagement
25 with and to be rotated by the pinion t . A stop v (shown as a screw arranged in the standard f') is employed to limit the return movement of the cylinder.

The clock-movement as a motor for our phonograph is selected for the purpose of this specification and without intending to limit our invention to it, and hence the following description of the operation must be understood with this reservation: The clock-movement having been wound up and the record-cylinder surface inscribed in the usual manner, the record-cylinder is rotated, and as it rotates the foot m gives to it and its shaft a progressively lateral movement. The spring l is
40 compressed during this movement until the cam r comes into contact with the foot m , at which time the said foot is lifted by the cam out of engagement with the screw-thread of the hub, when the spring is free to return the cylinder to its starting-point. By the lifting
45 of the foot the arm o^2 is also lifted, and it raises the stylus from the record-surface. When the foot is lifted, of course the opposite end of its lever o is depressed, and when
50 so depressed the spring q forces the latch into engagement with the lever and holds the foot up. The cylinder continues to rotate during this movement, and when the cam again comes uppermost it is in the plane of the toe or tappet p^2 , and, lifting such toe, rocks the latch
55 and disengages the latch from the lever o , thereby permitting the spring m^2 to throw down the foot into engagement with the screw-threaded hub and removing the arm o^2 from
60 engagement with the stylus, and thus permitting the phonograph to go on with its work. These operations are repeated so long as the power holds out, and hence a record on the cylinder may be repeated continuously with-
65 out, as heretofore, renewing the power after each complete movement of the cylinder. It is this automatic and continual repetition of

the record which distinguishes our invention and which also renders our invention peculiarly adaptable for advertising purposes, although, it need scarcely be said, the same characteristic of our invention fits it for more
70 extended use.

The spring-foot and its lifting, latching, and releasing mechanism may be designated generally and for the purposes of this specification as an "automatic clutch." Any clutching mechanism having the functions and mode
75 of operation of these parts may be substituted for them, and hence we mean not to limit our broad invention to any mere details of construction.
80

The image of the crow will have a suitable opening—for example, a partible bill—for the emission of sound, and such image is constructed also with a partible or separable body
85 for gaining access to the phonograph. The body of the image is made sufficiently strong to receive the frames of the phonograph and its motor.
90

Instead of operating the phonograph by power we may mount the slotted disk t upon a shaft or arbor t' in a bracket t^2 and apply thereto a crank or clock-key or other turning device t^3 , as illustrated in Fig. 4.
95

Obviously our invention of repeating mechanism is applicable to the Edison and kindred phonographs, wherein the record-cylinder slips on the shaft and the shaft has no sliding movement. (See Fig. 5.) In this case the
100 cam r may be made upon the hub of the record-cylinder or upon a collar and fixed to the shaft, and the ordinary handle s' may be substituted for crank s for operation by hand, or the shaft j may be geared for driving by
105 power.

In Figs. 6 and 7 we have shown a modification of our repeating mechanism. The foot m is made as a lever pivoted at 2 to the standard f' and normally borne into contact with
110 the screw-threaded hub i by a spring 3, which is fastened to the standard f' . The heel of the foot is made with a jog 4, which is engaged by the cam r to lift the said foot out of engagement with the threaded hub to permit
115 the spring l to return the record-cylinder. A latch 5, pivoted to the standard f' , swings laterally of the foot m to engage a notch 6 in its rear end to hold up said foot until the record-cylinder returns. A spring 7, acting
120 upon the latch 5, normally forces said latch toward the foot m . As the cam r comes uppermost when the latch is in engagement with the notch 6, it strikes the nose of said latch and forces it out of said notch, and
125 thus the foot is released to re-engage the screw-threaded hub and repeat the movement of the record-cylinder. The foot m in this form of our invention may carry also a stylus-lifter.
130

Instead of connecting the shaft j with its power-motor by means of toothed gears, we may use belting or other form of connection.

In applying our repeater to the Edison and

other forms of phonographs, we do not limit our invention to the use of the peculiar form of shaft-bearings here shown, but may use other forms.

5 What we claim is—

1. In a phonograph, a record-cylinder having a screw-threaded hub and usual means for receiving and transmitting a record, combined with means for rotating said cylinder continuously, a spring normally tending to return said cylinder, and a spring-foot screw-threaded to engage such hub, a lever to which the foot is jointed, a latch for periodically engaging such lever, and a cam for alternately lifting the foot and vibrating the latch for effecting the progressive movement of the cylinder to transmit its record and to return it automatically to the starting-point and repeat these operations, substantially as described.

2. In a phonograph, a rotary record-cylinder and usual means for receiving and transmitting a record, said cylinder having a screw-threaded hub, combined with a complementally screw-threaded foot, a cam connected to move with the hub, and intermediate mechanism acted upon by the cam for effecting the engagement of the foot with said hub and to disengage and re-engage the two automatically during the rotation of the cylinder to effect repetition of the record continuously, substantially as described.

3. In a phonograph, a rotary record-cylinder,

a shaft to which it is fixed, bearings in which said shaft has longitudinal motion, and usual means for receiving and transmitting a record, said cylinder having a screw-threaded hub, combined with a complementally screw-threaded foot, a spring to hold it in engagement with the hub, a lever from one end of which the foot is suspended, a latch to engage the other end of such lever, a spring normally tending to return the cylinder, and a cam to disengage the foot and hub and cause the engagement of the latch and lever and thereafter when the cylinder is returned to release the latch and lever and permit the foot to engage the hub, substantially as described.

4. In a phonograph, a phonograph-cylinder having a screw-threaded hub, a shaft to which it is fixed, and a cam on said shaft and bearings in which the shaft has a longitudinal movement, combined with a spring-foot to engage such hub, a lever to which the foot is jointed, and a latch adapted to engage such lever, substantially as described.

In witness whereof we have hereunto set our hands.

FRANCIS M. CRISWELL.

JAMES A. E. CRISWELL.

Witnesses as to Francis M. Criswell:

CHAS. E. GROSS,

GEO. F. GRAHAM.

Witnesses as to James A. E. Criswell:

PAUL JOHST,

W. MAYVILLE TWITCHELL.

1073 477

(No Model.)

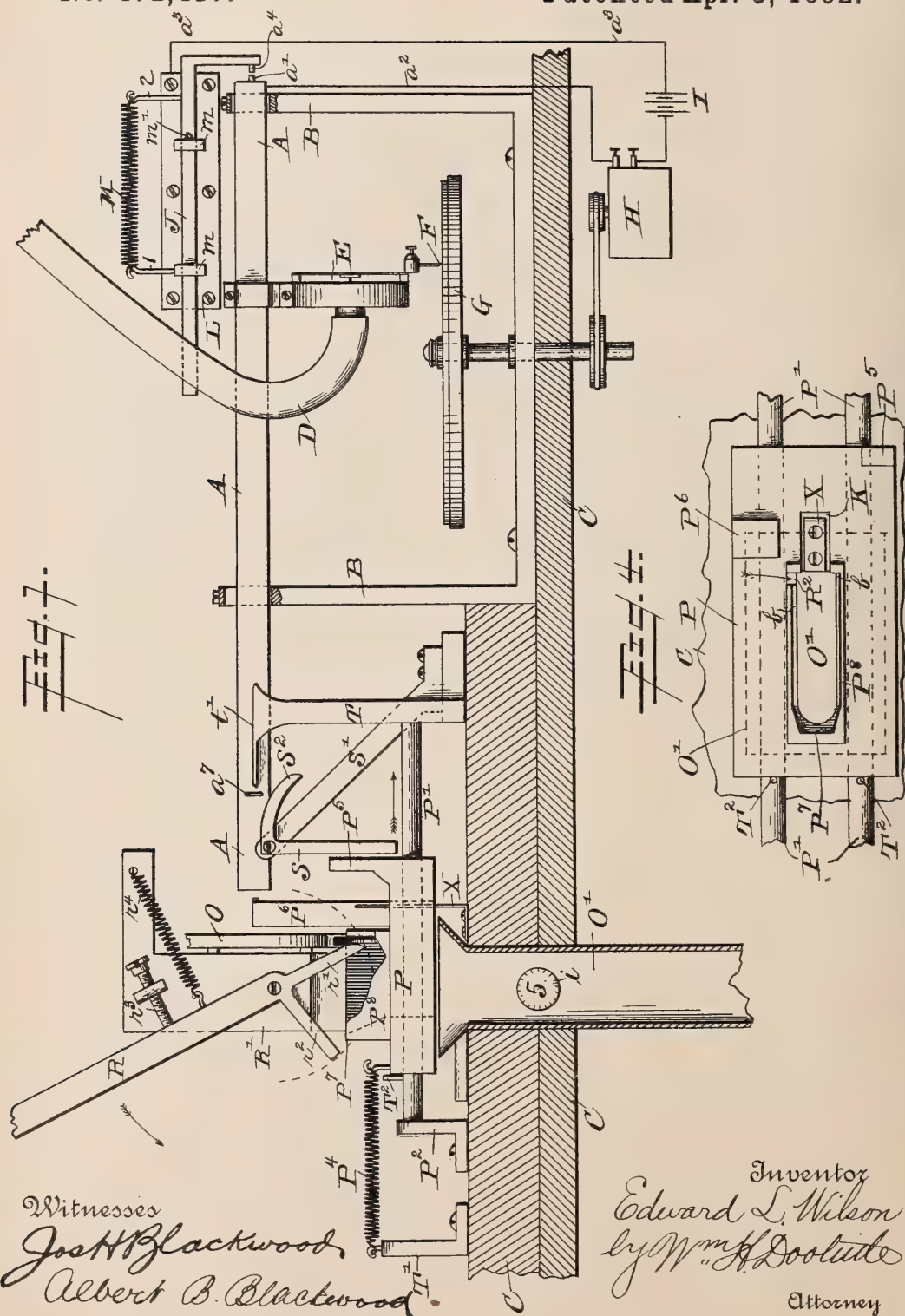
2 Sheets—Sheet 1.

E. L. WILSON.

COIN CONTROLLED APPARATUS FOR GRAMOPHONES.

No. 472,417.

Patented Apr. 5, 1892.



Witnesses

Josh H Blackwood

Albert B. Blackwood

Inventor

Edward L. Wilson
by Wm H. Dootz

by W^m H. Doolittle

Attorney

E. L. WILSON.

COIN CONTROLLED APPARATUS FOR GRAMOPHONES.

No. 472,417.

Patented Apr. 5, 1892.

Fig. 2.

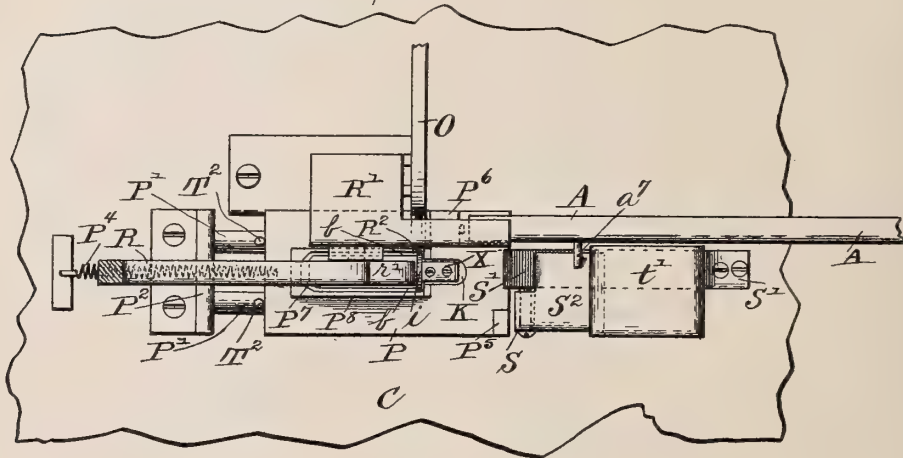
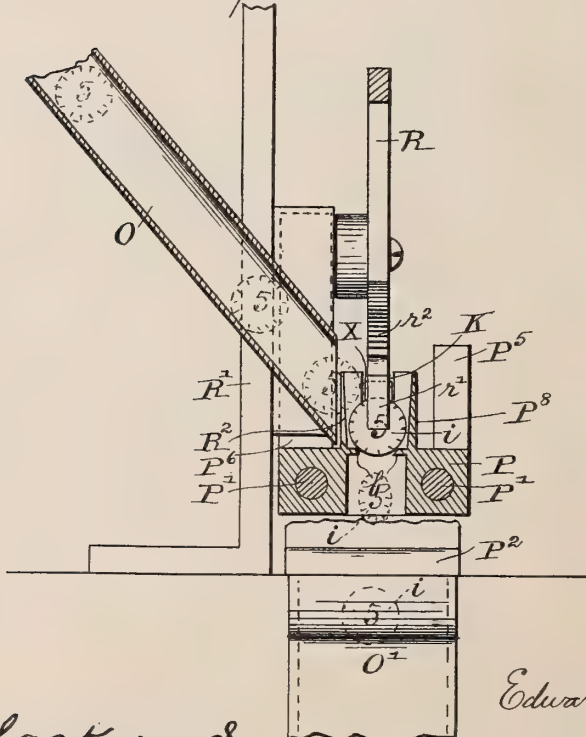


Fig. 3.



Witnesses

UNITED STATES PATENT OFFICE.

EDWARD L. WILSON, OF NEW YORK, N. Y.

COIN-CONTROLLED APPARATUS FOR GRAMOPHONES.

SPECIFICATION forming part of Letters Patent No. 472,417, dated April 5, 1892.

Application filed December 3, 1891. Serial No. 413,871. (No model.)

To all whom it may concern:

Be it known that I, EDWARD L. WILSON, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Coin-Controlled Apparatus for Gramophones; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a coin-controlled apparatus for gramophones.

In a machine called the "gramophone" the voice is first traced in curvilinear lines on the face of a rotating metal plate covered with a very delicate layer of fatty etching-ground by a recording-stylus, which is made to travel across the face of the rotating disk. From this etched record the voice can then immediately be reproduced by an apparatus having a reproducing-stylus. This is effected by giving the stylus a vibratory movement by and in accordance with the sinuosities of the record-groove, and these vibratory movements are transmitted to a diaphragm through a tube to the listener.

The object of my invention is to operate such a reproducing apparatus by a lever aided by a dropping of a coin of some specified denomination in a slot or chute, thereby setting in motion a system of levers and mechanism, which in turn will actuate the reproducer.

My invention is illustrated in one form in the accompanying drawings, in which—

Figure 1 is a side view in elevation, partly in section; Fig. 2, a plan of a carriage with its operating mechanism; Fig. 3, a detail end view, partly in section, of a coin-chute, a carriage, and operating-lever and coin-receiver; and Fig. 4, an enlarged plan view of the carriage.

Referring to the drawings, A is a bar or rod supported on standards B, rising from a suitable base C. The bar A is so supported as to have a free longitudinal and up-and-down movement on the standards B. On the bar A is carried a gramophone-reproducer consisting of a diaphragm E and a stylus F.

G is the circular record-disk of the gramophone, and D is a tubular transmitter of sounds from the diaphragm E. The stylus F is normally at the end of the inscribed record, which is at a point near the center of the disk G. The disk G is rotated by a suitable electric motor H and battery connection I. The bar A of the gramophone is provided with a contact-point a' , connecting with a line a^2 to the battery or other source of electricity.

J is a spring-controlled sliding bar sliding in supports $m m$ on a fixed plate L, to which plate is connected the opposite line a^3 of the electric circuit. The bar J has a contact a^4 to connect with contact a' on bar A. A spiral spring M is employed to return the bar J to its normal position with the circuit broken, after the apparatus finishes its operation, as hereinafter described. One end of spring M is connected by a hook 1 to the plate L, and the other end of the spring is connected by a hook 2 to the bar J.

O is a chute supported on an upright R' to guide a coin i of predetermined weight and denomination into the apparatus and to a slot R² in the side wall of a carriage P, and O' is a suitable receptacle at the bottom of the apparatus which finally receives such coin. Over the coin-receiver is placed the carriage P, mounted and sliding on rods P', which are secured to brackets P² and T, rising from the base of the machine.

P⁴ is a spring, one end of which is connected to the carriage P and the opposite end to a stationary upright T', (a part of the framework,) and the function of this spring is to return the carriage to its normal position after having been moved forward in the manner and for the purpose to be described. The backward movement of the carriage P is limited by the stops T² on rods P'. The carriage P is provided with two posts P⁵ P⁶, one in advance of the other, the rear post P⁶ being higher than P⁵ and having its top opposite to the end of the bar A. On the carriage is carried a box P⁸. This box is provided with ledges $b b$, on which the coin is received after it comes from the chute, and the coin rests in front of a slot K, formed in the front end of said box.

R is a lever pivoted to a stationary upright R', rising from the base at one side of and ex-

tending above the carriage P and provided with two arms r' r^2 . This lever is to be actuated by hand, and its range is limited by a set-screw r^3 on bracket R'. It is held normally in position against said screw by a spring r^4 on an arm on the upright R'.

S is a lever pivoted to an arm S', rising from the base of the machine, and provided with short arm S², the long arm of which lever is located in front of the post P⁵ on the sliding carriage. The bar A is provided with a lug a' , with which the arm S² of the lever S is adapted to come in contact. The bracket T, rising from the base of the machine, has a shelf-like top t' , extending parallel with the rod A and adjacent to the lug a' on the bar A.

The operation of my machine is as follows: When a coin is dropped into the chute O, it passes down and through slot R² in the box P⁸ and rests on ledges b in front of the arm r' of lever R. This lever R is then depressed by hand. This pressure is exerted against the force of the spring r^4 , to which the upper end of the lever R is attached. The lever-arm r' is then pressed against the coin and the carriage is forced forward. As said carriage is forced forward its front post P⁵ is carried against the long arm of lever S, which pressure serves to raise the short arm S² of said lever against the lug a' on the bar A of the gramophone. The raising of the bar lifts lug a' on a level with a shelf t' of post T and also lifts the gramophone diaphragm and stylus from off the record-disk. The continuing downward pressure of lever R carries the rear arm r^2 against the rear upright wall P⁷ of box P⁸, forcing the carriage still farther forward. This movement brings the rear post P⁶ against the end of the bar A. Bar A is then carried forward, the lug a' thereon riding on the shelf t' of the post T and for a distance sufficiently far to carry the reproducer-stylus to the side of the record-disk and at the beginning of said record. The lug a' then drops off the shelf t' and the stylus drops on the record-plate. At the same time the circuit connection is made with the motor through the contact-points of arm A and the bar J and the gramophone set in operation. In the meantime the coin has been carried forward in the box P⁸ until it meets a spring X, rising from the base in front of slot K in the box, and is then forced off its supports and falls into the receptacle O'. When the spring X meets the coin, the arm r' of lever R will have released it. The range of movements of lever-arms r' r^2 is indicated in dotted lines in Fig. 1. After connection is made with the motor the latter, connected by suitable bands to the shaft which carries the record-disk, rotates said disk, and the point of the stylus, resting in the sinuous groove on face of the disk, is carried along said groove toward the center of the disk and to the end of the groove, which is also the end of the

message or matter communicated to the ear through the diaphragm and ear-tube. The carriage P is drawn back by the force of the spring P⁴. The circuit-connecting bar J is carried back by spring M until stop m' thereon reaches a support m , and the apparatus is then ready for another operation.

Many of the parts of the apparatus may be changed without departing from my invention.

What I claim is—

1. A gramophone-reproducer, in combination with a sliding and lifting bar on which said reproducer is mounted, a lever to lift said bar, a spring-controlled longitudinal reciprocating carriage having arms to operate said lifting-lever, a coin attachment to hold a coin, and a spring-controlled lever to operate against the coin to move the said carriage forward, substantially as described.

2. In a coin-controlled apparatus for gramophones, a bar mounted on a suitable support and having a vertical and horizontal movement in said support, in combination with a gramophone-reproducer connected to said bar, a lever for giving said bar the vertical movement, a lever-operated slide for giving said bar a horizontal movement, and an upright support onto which said bar is lifted by said slide and moved thereby a certain distance horizontally after being lifted and then dropped by gravity to permit the stylus to fall upon the disk, substantially as described.

3. In a coin-controlled apparatus for gramophones, a coin-chute, in combination with a longitudinally-moving carriage beneath said chute to first receive the coin, a receptacle beneath the carriage to finally receive the coin, said carriage having supports for the coin, and a wall having a slot against which said coin rests, a spring-actuated lever to force said coin against the said end of the carriage and force the carriage along a certain distance, and a spring-bar to come in contact with the coin through the slot and throw it into the said receptacle, substantially as described.

4. The combination, with an electric motor and circuit, of a longitudinally-reciprocating bar carrying the gramophone-reproducer and provided with a contact-point, a spring-actuated reciprocating bar carrying the opposite contact-point and connecting with the motor, and a longitudinally-reciprocating carriage and lever for carrying forward the said reproducer-bar, the latter being carried back by said motor, and a spring for retracting said carriage, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWD. L. WILSON.

Witnesses:

WALTER CARROLL LOW,
PERCIVAL L. WATERS.

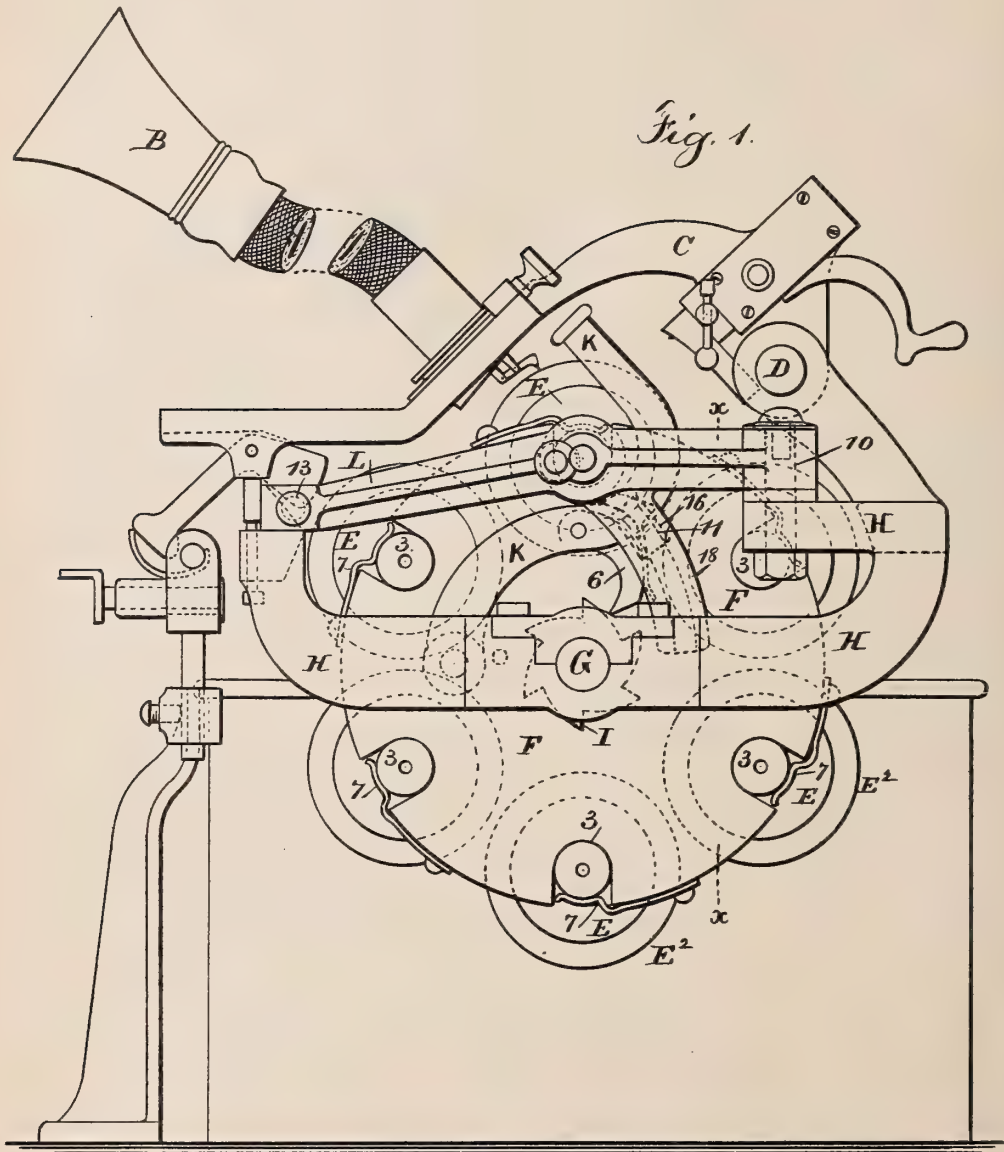
(No Model.)

3 Sheets—Sheet 1.

J. L. SKILLIN.
PHONOGRAPH.

No. 472,684.

Patented Apr. 12, 1892.



Witnesses

Chas. S. Smith
Harold Ferrell

Inventor

James L. Skillin
Per Lemuel W. Terrell

(No Model.)

3 Sheets—Sheet 2.

J. L. SKILLIN.
PHONOGRAPH.

No. 472,684.

Patented Apr. 12, 1892.

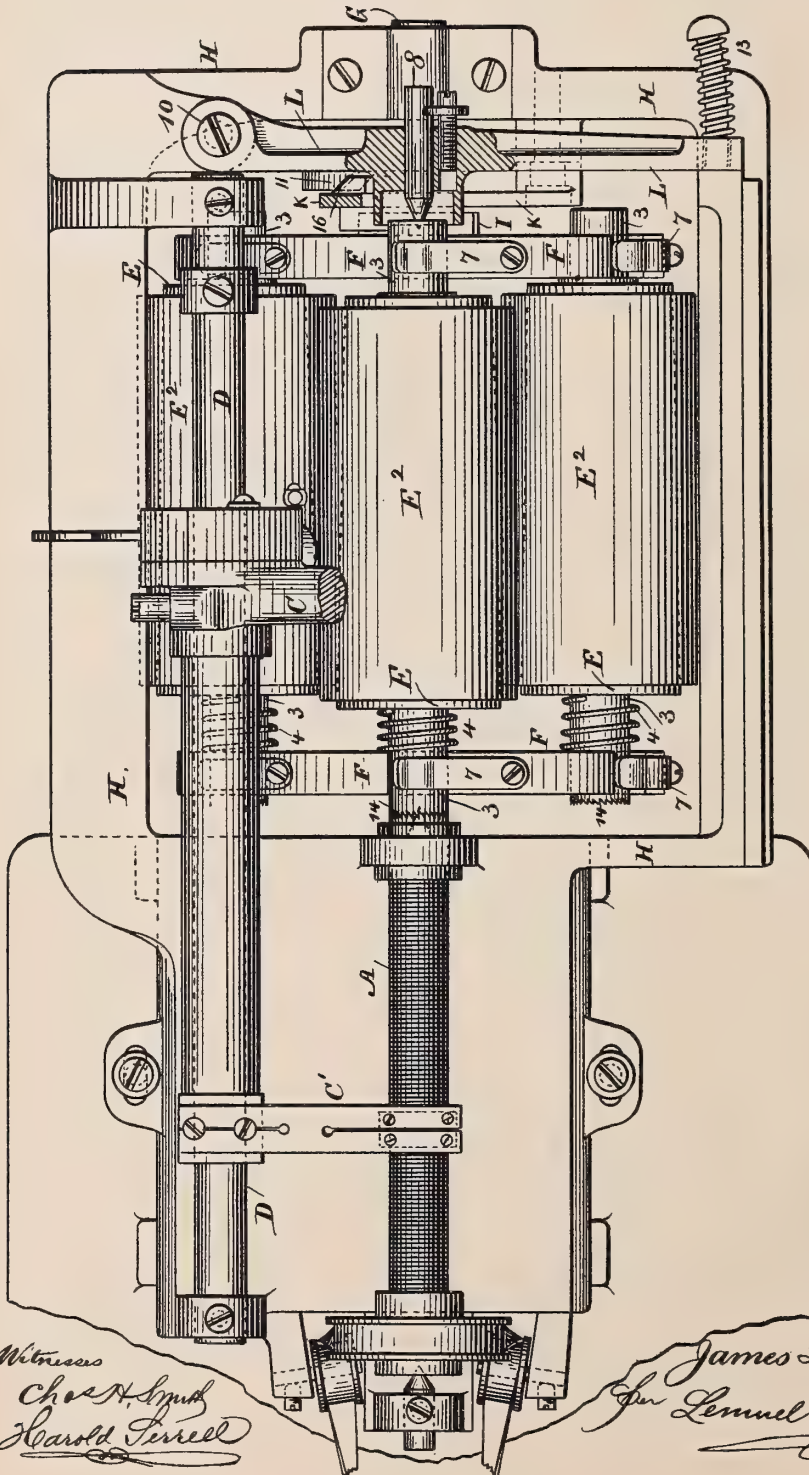


Fig. 2.

Inventor
James L. Skillin

For Lemuel W. Perrell

Witnesses
Chas. H. Smith
Harold Perrell

(No Model.)

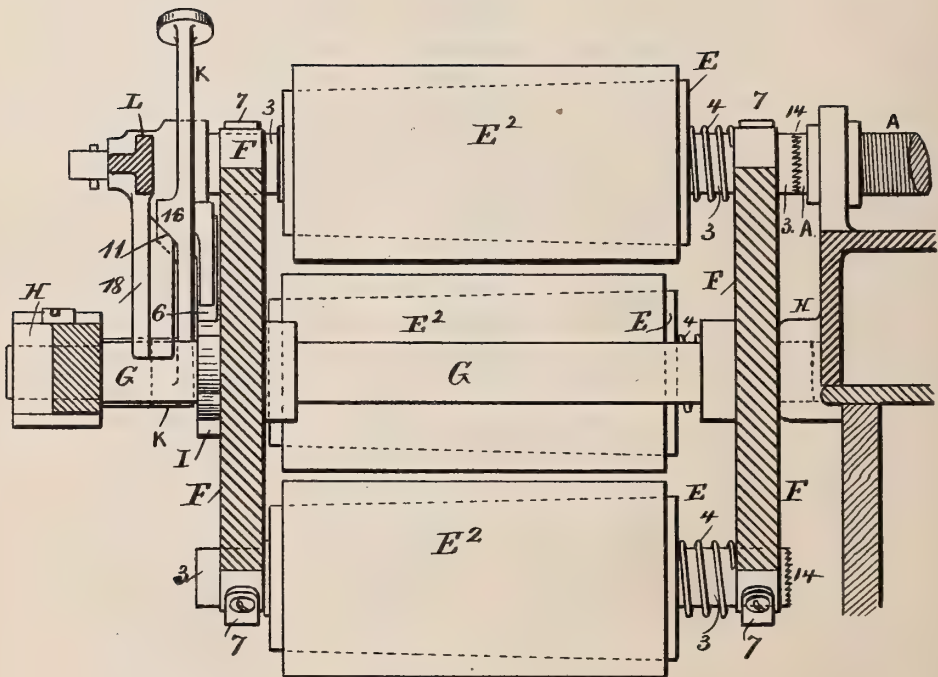
3 Sheets—Sheet 3.

J. L. SKILLIN.
PHONOGRAPH.

No. 472,684.

Patented Apr. 12, 1892.

Fig. 3.



Witnesses

Chas H. Smith
Harold Ferrell

Inventor

James L. Skillin.
per Lemuel W. Ferrell
att

UNITED STATES PATENT OFFICE.

JAMES L. SKILLIN, OF NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 472,684, dated April 12, 1892.

Application filed September 12, 1890. Serial No. 364,765. (No model.)

To all whom it may concern:

Be it known that I, JAMES L. SKILLIN, a citizen of the United States, residing in the city, county and State of New York, have invented an Improvement in Phonographs, of which the following is a specification.

Phonographic instruments have heretofore been constructed with tapering cylinders, upon which are received the phonogram-blanks to receive impressions from the vibrating point of the instrument in producing the phonogram, and these cylinders have been removable, so as to be re-entered upon the cylinder to reproduce the record, and in these phonograph-instruments when used for commercial, literary, and law purposes it is usual to stop the instrument and remove the phonogram that is full from the cylinder and to substitute another phonogram-blank. This has heretofore occupied some time and required personal attention and often dexterity of manipulation. Hence during these operations the flow of thought from the author or dictator is interrupted and the chain of circumstances lost.

In coin-actuated phonographic instruments it is usual to provide a cylinder rotated automatically and a lever that can be moved when a coin has been introduced into the instrument, in order that the reproducing-diaphragm may be brought to the starting end and the cylinder set in rotation; but heretofore it has been impossible to produce more than a repetition of the same tune, speech, or other phonographic reproduction on one cylinder, and by the insertion of a second coin there is a simple repetition of the first phonogram.

The object of my invention is to provide for the presentation to the rotating devices of one of a series of phonogram-cylinders, or to present such cylinders in succession to the rotating device, so that in machines that are made use of for taking down dictation for commercial or literary purposes the instrument can be stopped when one cylinder is full, and by the simple movement of a lever the full cylinder is carried out of position and an empty cylinder or phonogram-blank is brought into position and connected to the rotating device, so that very little interruption occurs to the dictator and very much time is

saved in the production of a phonogram, and where the phonographic instrument is made use of in exhibitions or in coin-actuated devices the carrier can be moved around to bring any desired cylinder into position for connection with the rotating device, so that by providing a number of phonogram-cylinders in one carrier either cylinder desired can be brought into position for connection with the rotating device, so that any tune, speech, or other phonographic reproduction can be brought into position and reproduced upon the instrument at the option of the person introducing the coin into the slot of the machine.

In the drawings, Figure 1 is an end view of the cylinder-carrier. Fig. 2 is a plan view of the same, showing, also, a portion of the ordinary phonograph-instrument. Fig. 3 is a section of the lever and supporting-bridge carrying the center for the phonogram-cylinder.

The shaft A is provided with a screw-thread upon it, and it is in line with and is used to rotate the phonogram-cylinder, and the mouth-piece B and indenting-point upon the diaphragm are of ordinary construction, and this mouth-piece is upon an arm C, extending out from and supported by a slide-bar D, there being a sleeve upon the slide-bar to connect the arm C with an arm C', passing out to the screw portion of the shaft A. These devices and the motor for rotating the shaft A are to be of any desired or usual character in phonograph-instruments, and may be varied to suit the phonograph or graphophone, and the instrument is to be adapted to recording or to reproducing the phonographic records.

Instead of only providing one phonogram-cylinder E axially in line with the shaft A and connected to or removable therefrom, I provide a number of phonogram-cylinders E, set in a carrier or reel F, having a central shaft G, to which the heads of the carrier are connected, and this central shaft G is supported in suitable bearings or frame-work H, and around the periphery of the carrier or reel there are notched bearings for the shafts 3 of the phonogram-cylinders E, and the distance between the central shaft G and the shafts 3 corresponds to the distance between

such central shaft G and the shaft A, so that as the shaft G and carrier F are rotated the axis of each phonogram-cylinder will be brought around in succession into exact line with the axis of the shaft A, and there is to be upon the end of the shaft A and the end of each shaft 3 suitable coupling or connecting devices—such, for instance, as a central point on the one part, a recess on the other, and interlocking crown-teeth or any equivalent coupling connection, as at 14—and around each shaft 3 and between the same and the adjacent carrier or head F there is a spring 4, so that the phonogram-cylinder is moved endwise by the spring to disconnect the clutches, so that the carrier and its cylinders are free to be rotated, and after being stopped with any one cylinder in line with the shaft A the couplings or clutches at 14 are caused to connect with each other by giving the shaft 3 that is in line with the shaft A an endwise movement toward such shaft A.

The carrier and the phonogram-cylinders supported by it can be rotated by any suitable means. I prefer a ratchet-wheel I, having as many teeth as there are phonogram-cylinders, and a pawl 6 upon the lever K can be used advantageously for rotating such carrier and cylinders, and the movement of the lever K should be limited by suitable stops, so that at this limit of movement one of the phonogram-cylinders E will be brought into line with the shaft A.

Each phonogram-cylinder E is to be of any desired construction. Usually it will be tapering and receive upon its surface the phonogram-blank of wax or any other suitable material E², removably applied upon the surface thereof, and the shaft of each phonogram-cylinder can be supported in the carrier or head F in any suitable manner.

I have represented the carrier-heads as notched around their peripheries for the reception of the shafts of the phonogram-cylinders, and there are springs 7 that can be swung over the journals or shaft of each phonogram-cylinder to retain such shaft in its proper position in the heads of the carrier, and by turning such springs to one side the cylinder and its shaft can be taken out and a different phonogram-cylinder inserted, as may be desired, and the bearings in the heads of the carrier for receiving the shafts of the phonogram-cylinders should be sufficiently loose not to produce unnecessary friction as the phonogram-cylinder is revolved by the shaft A, and it is advantageous to have the centering-point upon the shaft A enter a center hole in the shaft 3 and to make use of a centering-point 8 at the other end of the shaft 3, so that such shaft and the phonogram-cylinder may be revolved by the motor usually employed with such instruments, and this centering-point 8 is to be supported by a lever L, pivoted at 10, so that it may be swung laterally for withdrawing the centering-point 8 from the cavity at the end of the

shaft 3 of the cylinder that is in line with the shaft A; or when this lever L is moved in the other direction the centering-point 8 is to pass into the cavity of the shaft 3 and sufficient pressure is to be applied by the lever L for moving such shaft 3 endwise against the action of its spring 4, thereby causing the coupling or clutch 14 to connect the shaft 3 to the shaft A.

It is to be understood that the lever L is drawn back for freeing the cylinder that has been in use from the shaft A, so that the carrier and all the cylinders can be turned around upon the central shaft G to bring any other one of the phonogram-cylinders into line with the shaft A, and this may be accomplished by moving the lever L and pawl 6 once, twice, or more times, and the carrier F may be rotated by any other suitable means. It is, however, preferable to make use of the lever K in moving the lever L and point 8. With this object in view I provide upon the lever L an incline 11, adjacent to one side of the lever K, which incline 11 is made as a rib upon an arm 18 of said lever K, and the lever K may also be inclined, as at 16, where it comes into contact with the incline 11, and this incline 11 is sufficiently steep for the lever K to move the lever L the proper distance to withdraw the point 8 before the pawl 6 comes in contact with the next tooth upon the ratchet-wheel I, and it will be apparent that the lever K, remaining in contact with the downward projection, which is a continuation of the incline 11, keeps the point 8 away from the shafts 3 during the time that the carrier F is being rotated to bring another cylinder into position, and when the lever K receives its reverse or return movement the same passes above the incline 11 as it assumes a normal position, so that the lever L can be returned into its position, with the centering-point 8 in the recess at the end of one of the shafts 3, and there may be a spring 13 applied to the lever L sufficiently powerful to overcome the spring 4 and to move the shaft 3 and phonogram-cylinder endwise to couple the same to the shaft A and to keep the parts properly in contact while the motor is rotating the shaft A and the phonogram-cylinder, and, if desired, a swinging button or holder may be applied at the end of the lever L, as usual in phonographs, for holding such lever in position with the centering-point at the end of the shaft of the phonogram-cylinder.

With coin-actuated phonograph-machines it is preferable to actuate the lever K by hand from the outside of the inclosing case, and to construct such inclosing case with a dial or other indicating device moved by the carrier F to denote the tune or other reproduction upon each cylinder that is brought around into position, and by so providing the coin-actuated phonograph the revenue derived from the same is increased, because there can be so many more cylinders for phonographic reproductions that parties are likely to intro-

duce several coins in succession in order to hear the different phonographic reproductions. It will also be apparent that my present improvements are available with any of the mouth-pieces, diaphragm-points, speaking-tubes, and other appliances now provided or usually employed in phonographs or graphophones in producing the phonogram or in reproducing the audible sounds.

In this specification I have referred especially to phonographs, but by that expression I intend to include graphophones and all similar instruments.

I claim as my invention—

1. The combination, with a phonographic motor-shaft, of a carrier and two or more phonogram-cylinders and their shafts supported by such carrier, and coupling devices for connecting the shaft of either phonogram-cylinder to the motor-shaft when in line with the same, and the screw-shaft, diaphragm, and arm carrying the same, substantially as set forth.

2. The combination, with the phonographic motor-shaft, of a carrier adapted to receive two or more phonogram-cylinders and their shafts, a lever, pawl, and ratchet-wheel for rotating the carrier to bring any one of the phonogram-cylinder shafts into line with the motor-shaft, and a swinging lever and centering-point for supporting the shaft and phonogram-cylinder while being rotated, substantially as set forth.

3. The combination, with the motor-shaft in a phonograph-machine, of a carrier having two heads with notched bearings in their peripheries, two or more phonogram-cylinders and their shafts received into such bearings in the carrier, a spring applied to each motor-

shaft to move the same endwise, coupling devices upon the cylinder and motor-shafts, respectively, that are disconnected by such springs, mechanism for rotating the carrier and bringing the phonogram-cylinders around successively into line with the motor-shaft, a swinging lever and central point, and means for pressing the centering-point against the end of the phonogram-cylinder shaft to couple the same to the motor-shaft, substantially as set forth.

4. The combination, with a carrier and its supporting-shaft, of two or more phonogram-cylinders and their shafts received into and supported by such carrier, a motor-shaft and coupling devices for connecting the motor with either of the phonogram-cylinder shafts in line with the same, a centering-point, a lever for supporting the same, and a lever for rotating the carrier progressively and for moving the centering-point and its lever out of or into contact with the phonogram-cylinder shaft, substantially as set forth.

5. The combination, with the phonograph motor-shaft, of a carrier, two or more phonogram-cylinders and their shafts supported by the carrier, and mechanism, substantially as specified, for moving the carrier to bring the shafts of the phonogram-cylinders into line with the motor-shaft successively and for removing and replacing the support for the outer end of the phonogram-cylinder shaft, substantially as set forth.

Signed by me this 10th day of September, A. D. 1890.

JAMES L. SKILLIN.

Witnesses:

HAROLD SERRELL,
WILLIAM G. MOTT.

472 684

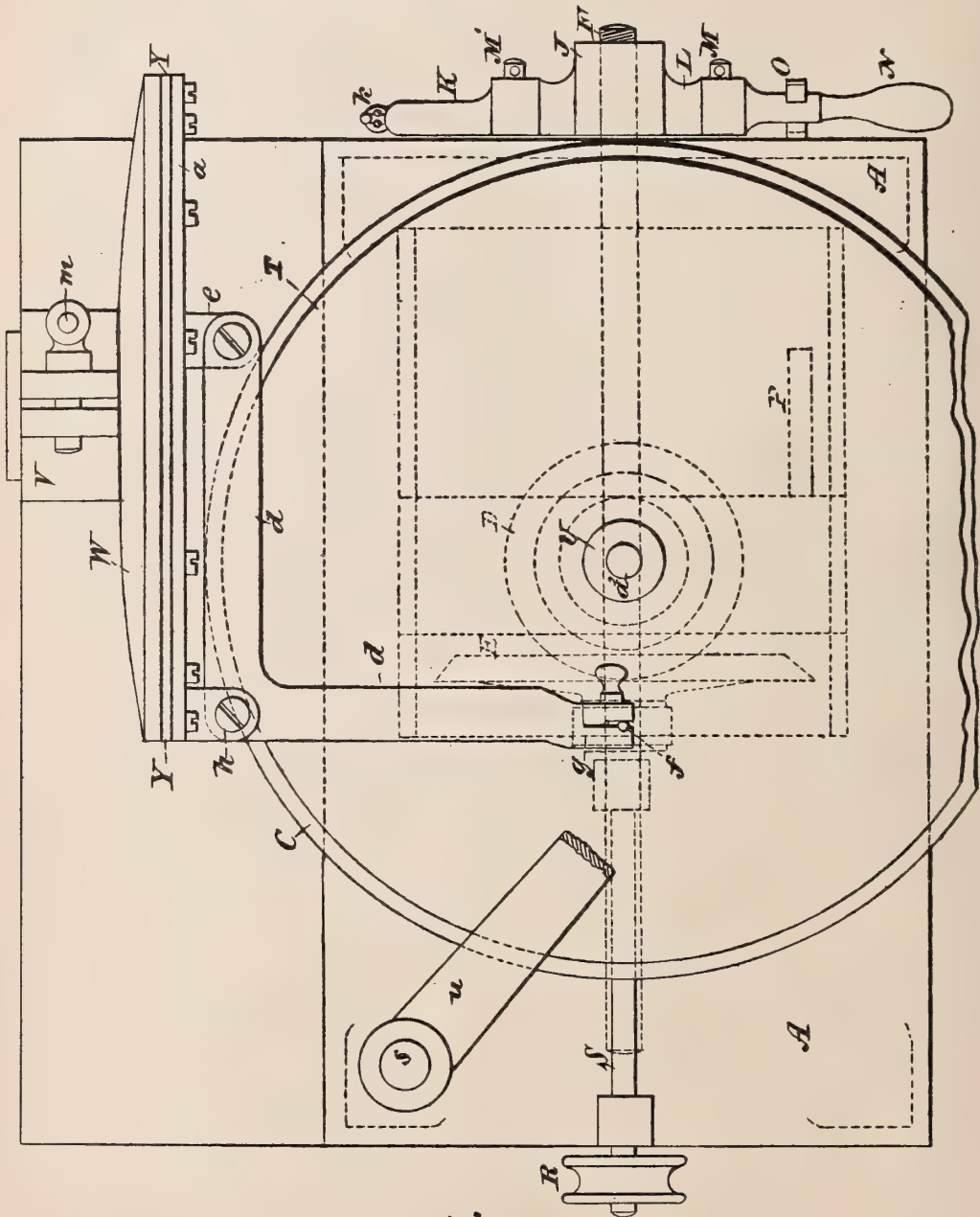
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4 Sheets—Sheet 1.

L. ROSENTHAL & S. FRANK.
APPARATUS FOR REPRODUCING SOUNDS.

No. 474,410.

Patented May 10, 1892.



WITNESSES:
Gustav Hietrich.
Geo. W. Taylor, Jr.

Fig. 1.

INVENTORS
Louis Rosenthal
Salomon Frank
BY *Brisson & Knauth*
their ATTORNEYS.

(No Model.)

4 Sheets—Sheet 2.

L. ROSENTHAL & S. FRANK.
APPARATUS FOR REPRODUCING SOUNDS.

No. 474,410.

Patented May 10, 1892.

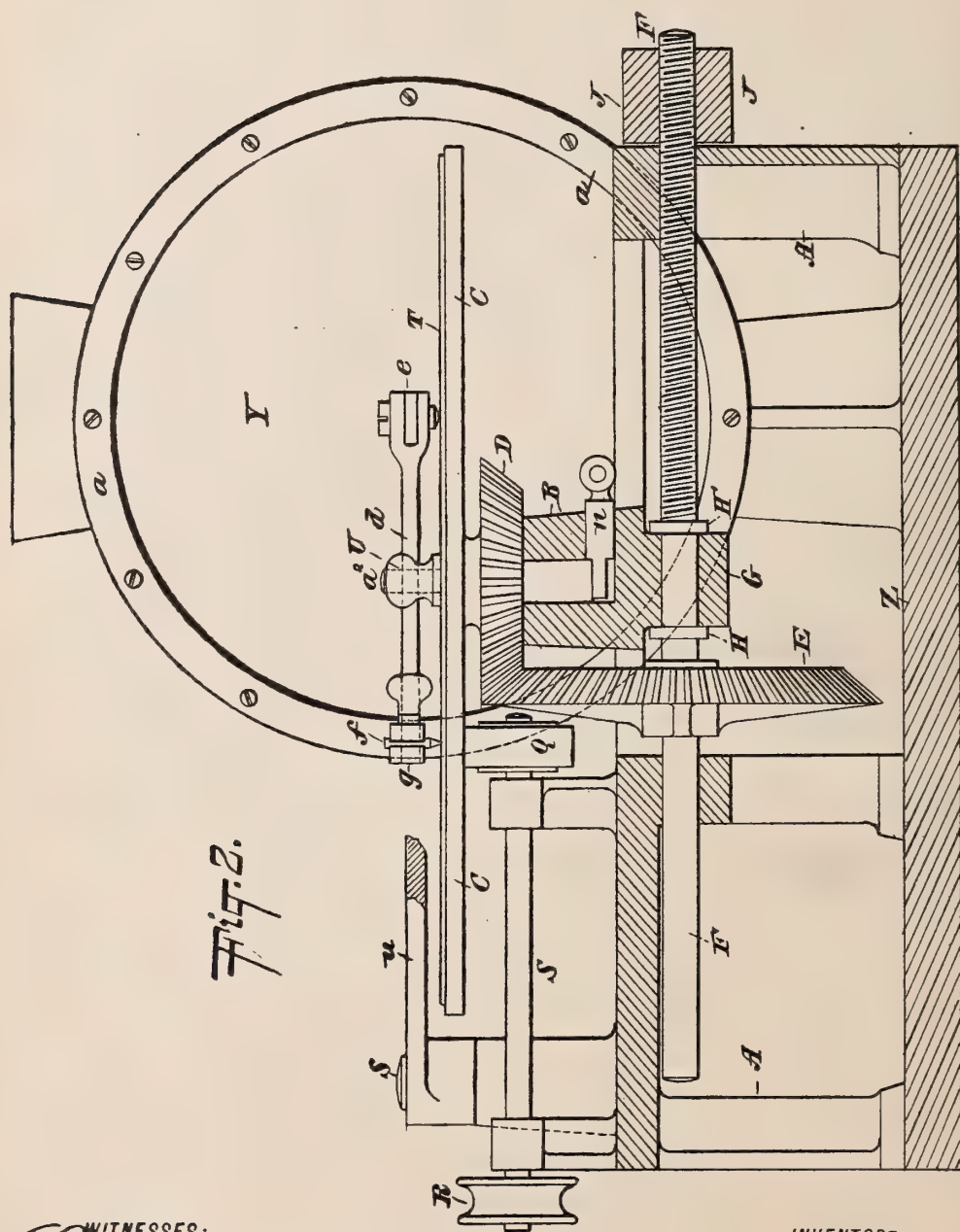


Fig. 2.

WITNESSES:
Gustave Dietrich
Geo. W. Taylor Jr.

INVENTORS
Louis Rosenthal
Solomon Frank
BY *Briesen Knaut*
their ATTORNEYS.

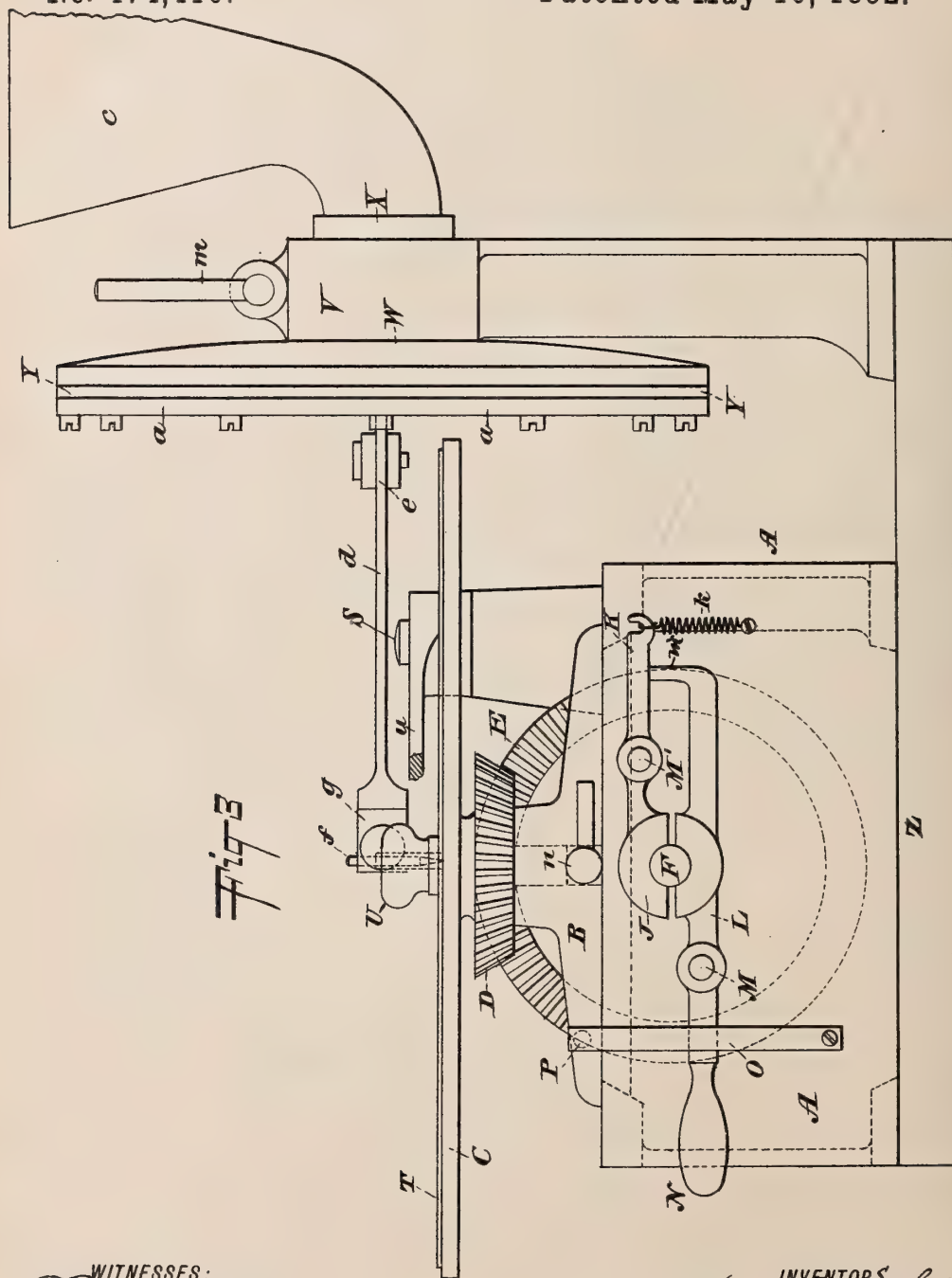
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4 Sheets—Sheet 3.

L. ROSENTHAL & S. FRANK.
APPARATUS FOR REPRODUCING SOUNDS.

No. 474,410.

Patented May 10, 1892.



WITNESSES:
Gustave Richter
Geo. W. Taylor

INVENTORS
Louis Rosenthal
Salomon Frank
BY *Briesen Knaut*
their ATTORNEYS.

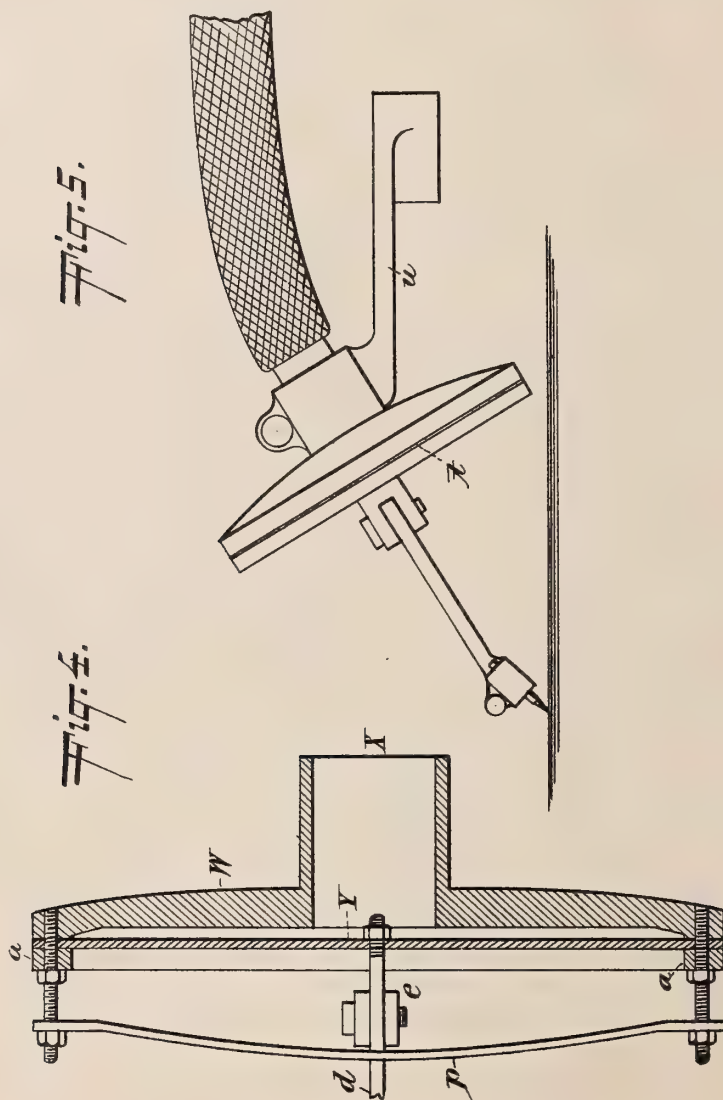
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4 Sheets—Sheet 4.

L. ROSENTHAL & S. FRANK.
APPARATUS FOR REPRODUCING SOUNDS.

No. 474,410.

Patented May 10, 1892.



WITNESSES:
Gustave Daitonoh.
Geo. W. Taylor Jr.

INVENTORS
Louis Rosenthal
Solomon Frank
BY *Briesen & Knautz*
THEIR ATTORNEYS

UNITED STATES PATENT OFFICE.

LOUIS ROSENTHAL AND SALOMON FRANK, OF FRANKFORT-ON-THE-MAIN,
GERMANY.

APPARATUS FOR REPRODUCING SOUNDS.

SPECIFICATION forming part of Letters Patent No. 474,410, dated May 10, 1892.

Application filed January 21, 1892. Serial No. 418,862. (No model.)

To all whom it may concern:

Be it known that we, LOUIS ROSENTHAL and SALOMON FRANK, both residing at Frankfort-on-the-Main, Germany, have invented new and useful Improvements in Apparatus for Reproducing Sounds, of which the following is a specification.

This invention relates to phonographs, and has for its object to obviate the difficulties incidental to phonographs and graphophones, particularly in regard to the disk and diaphragms, the object being to produce durable and efficient phonograph disks and diaphragms.

In our improved instrument we actuate the phonograph-disk by a friction-wheel, which preserves a constant position in relation to the stylus, while it actuates the disk at a gradually-variable radius corresponding to that of the stylus, so that the angular velocity of the disk is diminished exactly in proportion as the point at which the stylus acts recedes from the center of the disk. We are enabled thereby to produce a record from which an accurate and uniform reproduction of the sounds may be obtained.

In the drawings forming part of this specification, Figure 1 is a top or plan view of the improved graphophone. Fig. 2 is a side view thereof, partially sectional. Fig. 3 is an end view of the same. Fig. 4 shows a special arrangement of the recording-diaphragm; and Fig. 5 shows the arm carrying the transmitting-diaphragm and stylus, which are only partly shown in the first three figures.

The table C, supporting the phonograph-disk, is mounted and rotates on an axis a^2 , carried by the sliding carriage B, which is supported on the frame A. The table C is traversed under the stylus f by the screw-shaft F, which engages said carriage B by means of flanges H H' and fits a fixed nut J. This screw-shaft F is driven by the bevel-gear D E, the gear-wheel D being securely fastened to the table C and the other gear-wheel E being splined to the screw-shaft F. The nut J is by preference made in two parts, which are respectively connected with levers K and L, that are pivoted to the frame A at M' and M. The one end of lever K is actuated by the spring k , which prevents the upper half of

the screw-nut from becoming engaged with the screw-shaft F. An arm m^2 of the lever L, which connects to the lower half of the screw-nut J, reaches under the lever K, as in Fig. 3, and thus by the spring k the lower half of the screw-nut is also kept away from the threaded portion of the shaft F. By pressing on the handle N of lever L both halves of the screw-nut are simultaneously thrown into engagement with the screw F, in which position they are retained by a spring-latch or other catch O. When the shaft F is rotated by the bevel-gear D E, it moves longitudinally by means of the nut J and carries the carriage B, together with the table C, along. As soon as the stud P, which is fastened to the carriage B, strikes the latch O the screw-nut halves J are pulled apart by the spring k . This will cause the carriage B to remain stationary and nevertheless allow the shaft F and table C to rotate. When thus released, the carriage B is free to be traversed by hand back to its starting-point, the phonogram-table C being then raised out of contact with the friction-roller Q by an eccentric n or other device. The phonogram-table is rotated about its axis a^2 on the carriage B by the frictional contact of the roller Q, which receives its motion from the shaft S and pulley R, and which is situated at its under side immediately beneath the stylus f , so that the radial distance of said roller Q from the center of the table always corresponds or bears a fixed relation to that of the stylus. The part of the phonogram upon which the stylus is for the time acting will always travel under the stylus at a constant velocity, and the sound-waves are recorded uniformly over the whole phonogram-disk. On the table C rests the real phonogram-disk T, which is preferably made of zinc and which is fastened to the table C by a clamp-nut U or otherwise.

Near the frame A is erected on its base-plate Z or otherwise the frame V, which carries the large sound-recording diaphragm. This diaphragm Y is clamped marginally to a concave or casing W, having at its back a central tube X, which is held in a fixed clamp and to which the trumpet-shaped mouthpiece is connected. The diaphragm Y is clamped tightly to the casing W by a ring a . To the

center of the diaphragm is connected a swivel-pin *e*, to which one arm of a bell-crank lever *d* is pivoted, the lever at its elbow being fulcrumed at *h* to the casing or frame, the
 5 other arm carrying the stylus *f* by means of the clamp *g*, said stylus being made of suitable hard material. The advantage of this lever over those heretofore used is that the transmission to the diaphragm of vibrations
 10 of the stylus, caused by the working of the instrument or by inequalities of the phonogram-disk, is prevented. When large diaphragms are used, a strong check-spring *p*, Fig. 4, is applied to act on the diaphragm at
 15 its center joint *e* to prevent false or disturbing oscillations. The unusual stoutness of the diaphragm enables the stylus to indent the record of the most delicate sound-waves directly in the phonogram-disk in which the
 20 sound-wave is produced in the form of a close spirally-wound sinuous or serpentine line or furrow.

The reproduction of the sound is effected by means of another diaphragm *t*, (illustrated
 25 in Fig. 5,) supported by a swinging arm *u*, mounted on pivot *S*. As it has not to perform the same mechanical work as the recording-diaphragm, it may be made of much smaller dimensions, the stylus being carried by an
 30 arm jointed to the center of the diaphragm, which is so held by its supporting-bracket that when brought into position over the phonogram the stylus and arm will be at an acute angle to the plane thereof. When this diaphragm is brought into use, the recording-
 35 diaphragm *Y* is turned round in its clamp *V*, loosening the screw *m*, so as to lift the recording-stylus *f* off the table. Thereupon the reproducing-diaphragm *t* and its stylus are
 40 brought into action by turning their supporting-bracket *u*.

Having described our invention, what we claim is—

1. The combination of a diaphragm *Y*, elbow-lever *d*, pivoted at its inner end to a central stud on said diaphragm, clamp *g*, secured to the outer end of said lever, stylus *f*, adjustably secured in said clamp at right angles to the plane of said lever and parallel with the
 50 plane of the diaphragm and receiving its de-

sired lateral motion therefrom, table *C*, and mechanism for moving said table under said stylus, all said parts being arranged and adapted to operate substantially as described, and for the purposes set forth. 55

2. The diaphragm *Y*, combined with the tension-spring *p*, elbow-lever *d*, pivoted to said diaphragm *Y* between the tension-spring *p* and the diaphragm, and stylus *f*, substantially as and for the purposes herein shown 60 and described.

3. The combination of the rotary table *C* and its shaft *a*² with the sliding carriage *B*, screw-shaft *F*, divided nut *J*, pivoted lever *K*, connected to the upper portion of said divided 65 nut, spring *k*, automatically controlling said lever *K*, lever *L*, connected to the lower portion of said divided nut and provided with an arm at its inner end adapted to bear against the lever *K*, and handle *N*, secured to the 70 outer end of lever *L* and adapted, in connection with spring *k*, to operate both levers *K* and *L* for opening or closing said divided nut, all substantially as described, and for the purposes set forth. 75

4. The combination of the rotary table *C* and its shaft *a*² with the sliding carriage *B*, having prong *P*, screw-shaft *F*, divided nut *J*, levers *K* *L*, spring *k*, and catch *O*, all arranged substantially as herein shown and described. 80

5. The combination of the table *C* with the stylus *f* and friction-wheel *Q* for rotating said table *C*, said stylus and wheel being placed on opposite sides of said table and in 85 direct line with each other and at an equal distance from the axis of the table and with the screw-shaft *F*, gearing from the table *C* to the shaft *F*, carriage *B*, nut *J*, levers *K* *L*, and spring *k*, all arranged substantially as and for 90 the purposes specified.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

LOUIS ROSENTHAL.
 SALOMON FRANK.

Witnesses:

FRIEDRICH OSKAR KIEHLMANN,
 FRANZ BORG,

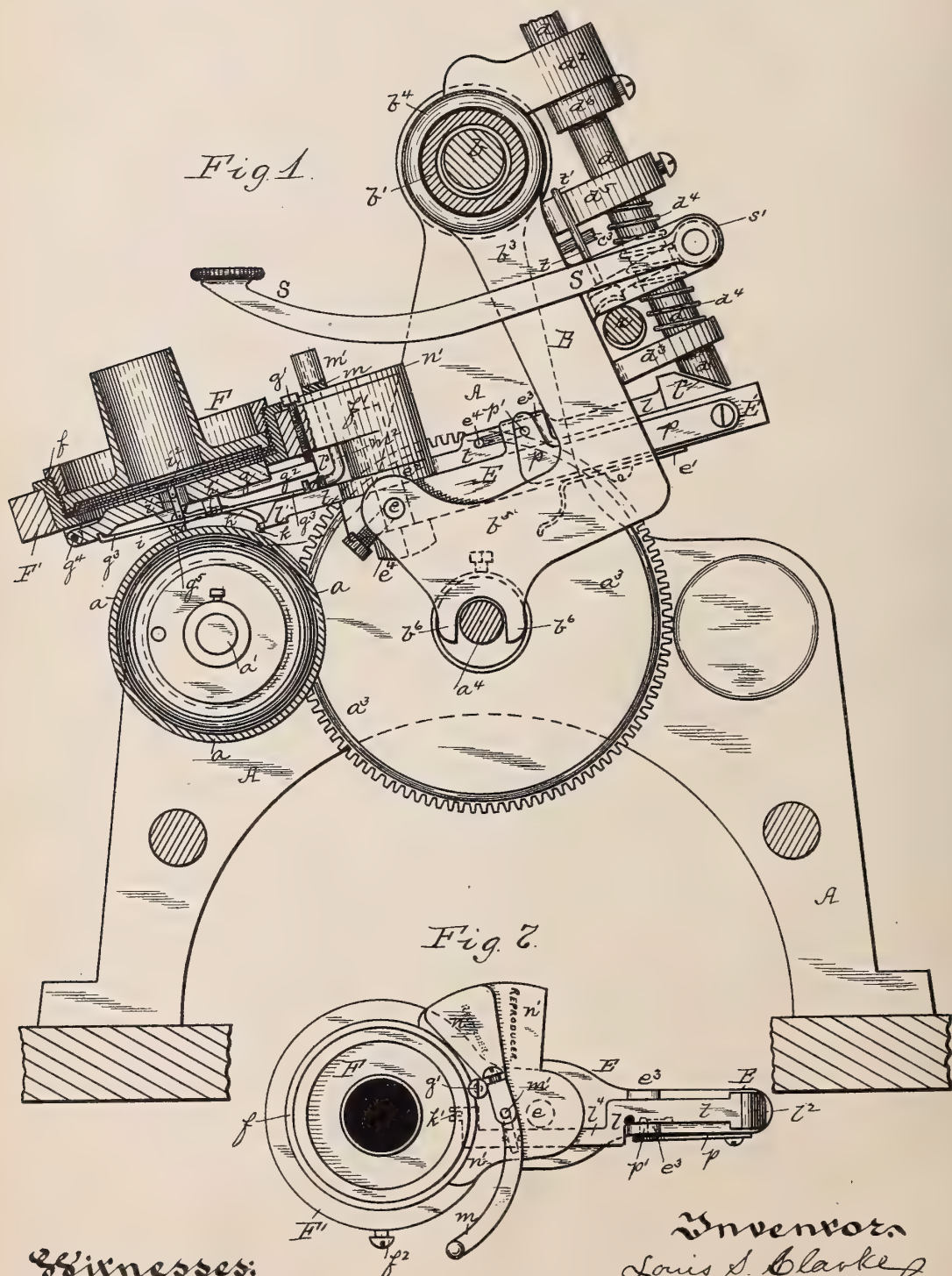
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4 Sheets—Sheet 1.

L. S. CLARKE.
PHONOGRAPH.

No. 474,946.

Patented May 17, 1892.



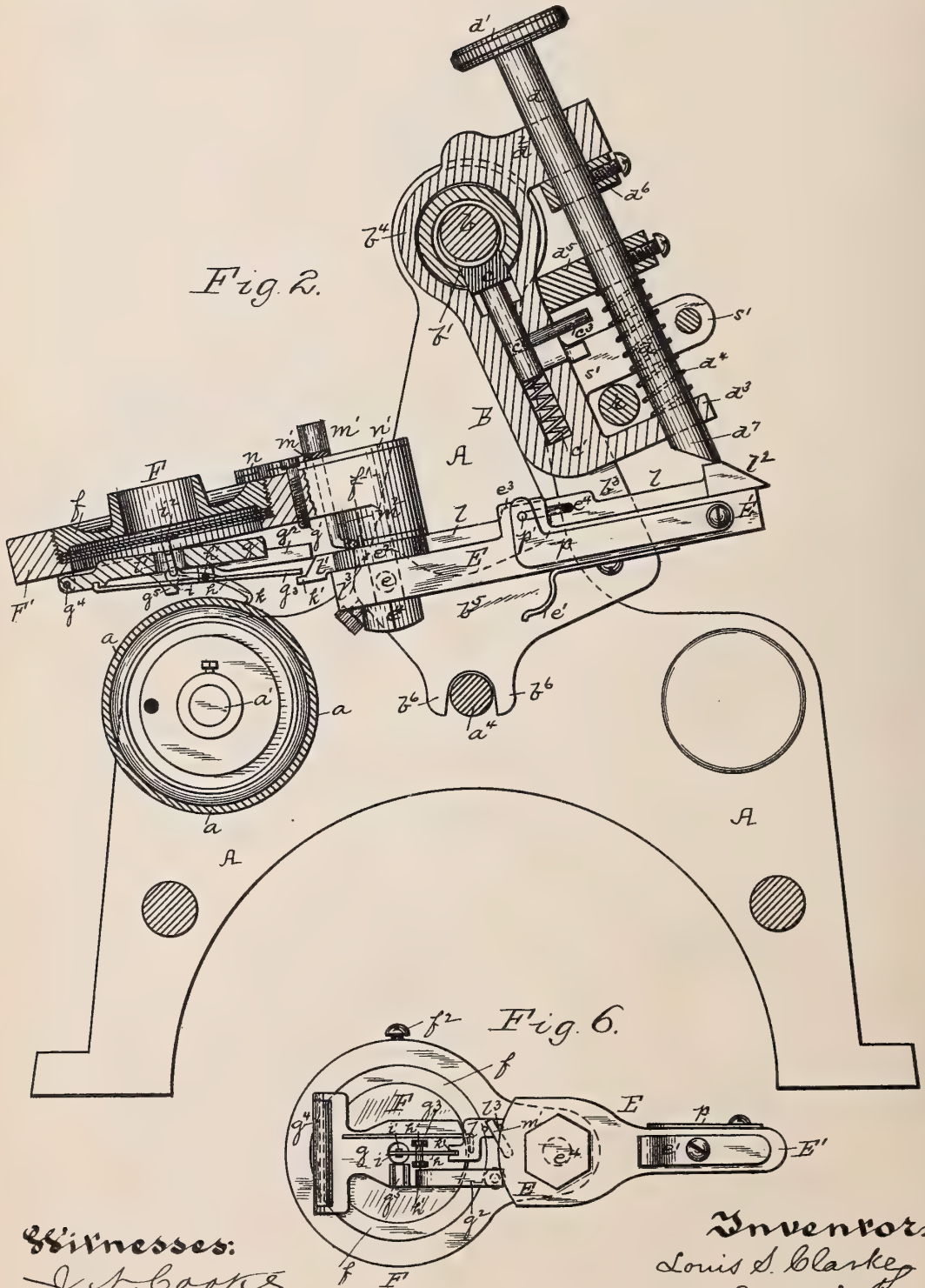
Witnesses:
J. A. Coates,
Robt. D. Totten

Inventor:
Louis S. Clarke
By James D. Ray
Attorney

L. S. CLARKE.
PHONOGRAPH.

No. 474,946.

Patented May 17, 1892.



Witnesses:

J. A. Cooke
Robt. D. Totten

Inventor
Louis S. Clarke
By James D. Ray
Attorney

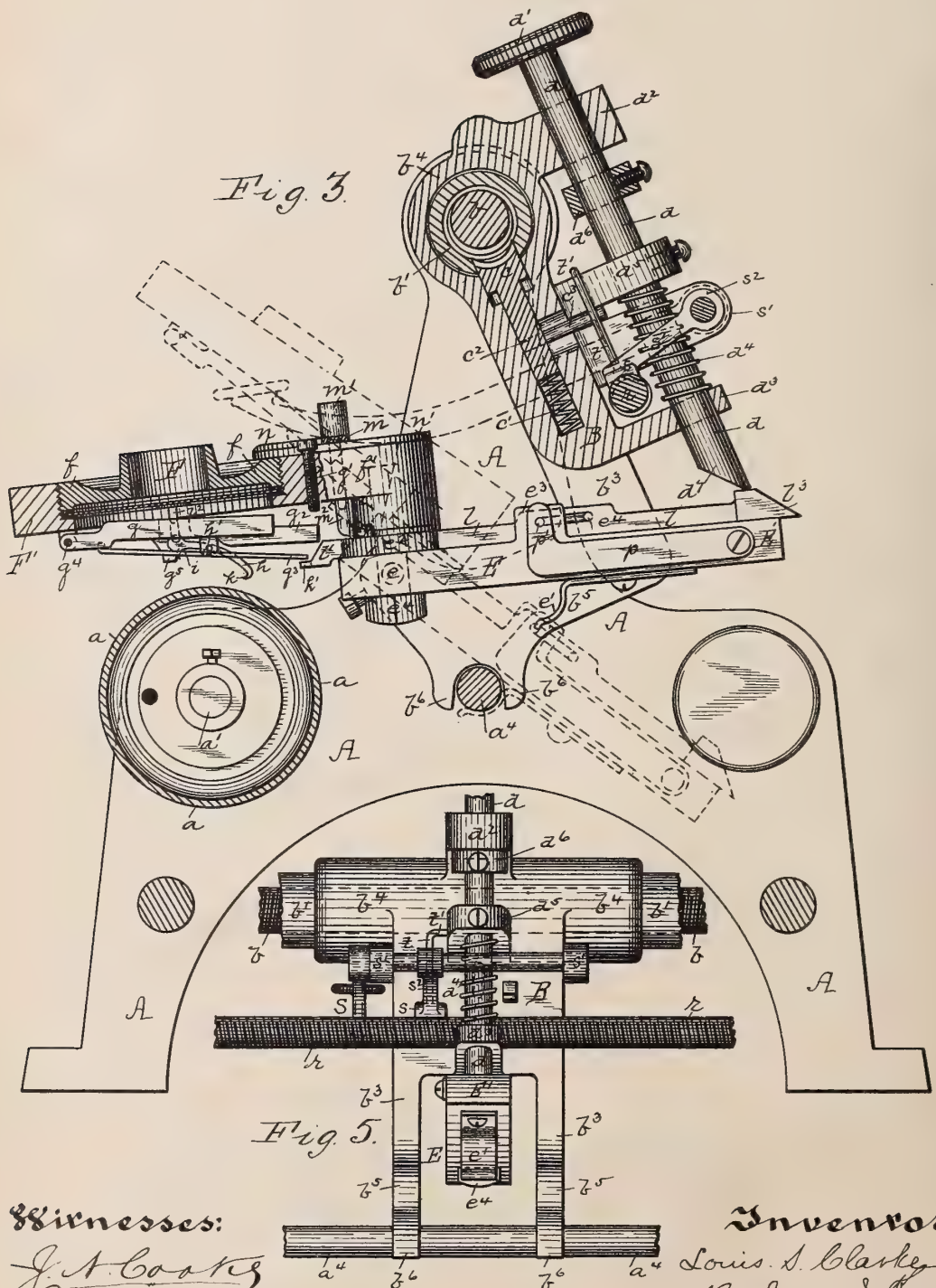
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4 Sheets—Sheet 3.

L. S. CLARKE.
PHONOGRAPH.

No. 474,946.

Patented May 17, 1892.



Sicknesses:

J. A. Coates
Robt. D. Lotter

Inventor.

Louis. S. Clarke
By James S. Kay
Attorneys

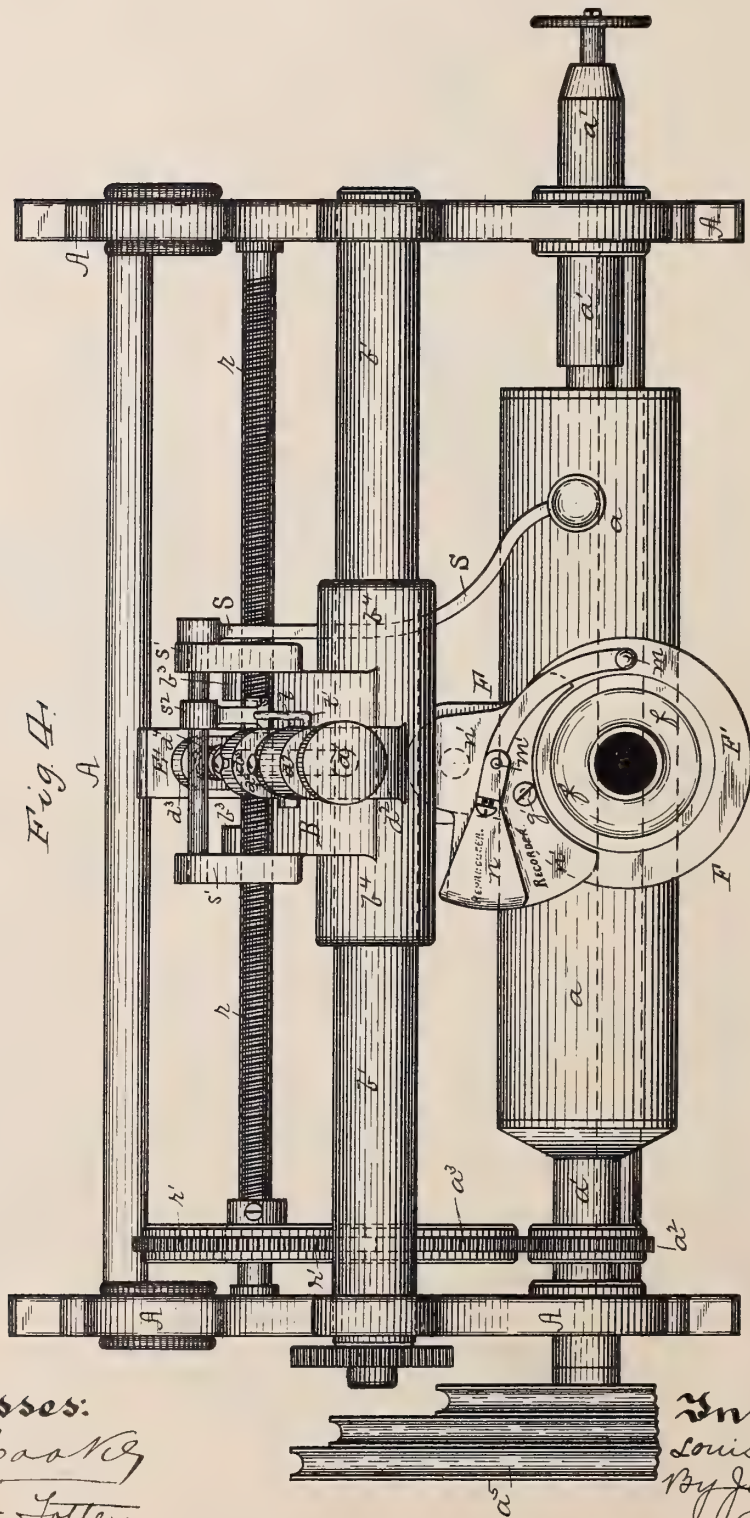
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4 Sheets—Sheet 4.

L. S. CLARKE.
PHONOGRAPH.

No. 474,946.

Patented May 17, 1892.



Sirnesses:

J. A. Coakley
Ross D. Follen

Inventors
Louis S. Clarke
By James S. Kay
attorney

UNITED STATES PATENT OFFICE.

LOUIS S. CLARKE, OF PITTSBURG, PENNSYLVANIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 474,946, dated May 17, 1892.

Application filed December 23, 1889. Serial No. 334,650. (No model.)

To all whom it may concern:

Be it known that I, LOUIS S. CLARKE, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Phonographs; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to phonographs, its object being to improve these instruments or machines in certain particulars. It is well known that both in the "phonograph" and the "graphophone," as they are termed, it has been considered necessary to employ two diaphragms, one for recording and the other for reproducing, these two diaphragms in the phonograph being arranged in a frame, and it being necessary to swing the frame in order to bring the one or the other diaphragm into position, and in the graphophone-machine the different mechanisms for recording and for reproducing being formed separate and the one removed from the machine in order to apply the other thereto.

One object of my invention is to overcome this difficulty by so improving the machine that the same diaphragm is employed for both recording and reproducing, the shifting of a small lever being all that is necessary to make the change.

Another object of my invention is to provide for the use of the phonograph recorder and reproducer upon the graphophone-machine. It is also found very desirable to provide for the moving back of the diaphragm for a short distance during reproducing in order to provide for the repetition of part of the record made on the cylinder, and by my invention I provide a simple means for obtaining this result.

My invention has also certain further objects, all of which will be hereinafter more fully set forth, and the special improvements embodied in my invention will be particularly claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a side view showing the instrument in position for recording and showing the diaphragm in sectional view. Fig. 2 is a sectional view, partly in side elevation, show-

ing the machine in position for reproducing, the driving-gearing being omitted. Fig. 3 is a like sectional view, partly in side elevation, showing the position of the machine when the mechanism for drawing the diaphragm backwardly is in operation. Fig. 4 is a top or plan view of the machine. Fig. 5 is a detail back view of part of the machine. Fig. 6 is a detail bottom plan view, and Fig. 7 is a detail top plan view, of the diaphragm and reversing mechanism.

Like letters of reference indicate like parts in each figure.

My invention is illustrated as applied to a graphophone-machine, though it is evident that it can be well applied to the ordinary phonograph-machine, such changes being made therein as would be required, such as in the supporting of the frame and the connections with the feeding mechanism.

As illustrated in the drawings, the frame A of the machine carries the cylinder-holder a' by which the recording-cylinder a is supported, this cylinder-holder being driven by the pulley a^5 and driving, through the gearing a^2 a^3 , the shaft a^4 , and from it by suitable gearing the feeding-screw b . The shaft a^4 extends the full length of the machine-frame, as in the ordinary graphophone-machine. The feeding-screw b is mounted in the upper part of the machine-frame and inclosed in a sheath b' , and the frame B, carrying the diaphragm-frame E, is mounted on the shaft a^4 and the sheath b' , which incloses the major portion of the feeding-screw b .

The frame B has two side bars or plates b^3 extending down from the sleeve b^4 , fitting around the sheath b' , these two side plates having the inwardly-extending portions b^5 , with forks b^6 at the base thereof, which fit around the shaft a^4 and the frame being thus supported.

The frame B carries the concave face or sectional nut c , which by the spring c' is pressed upwardly into contact with the screw-bar b , the frame being fed forward by the rotation of the screw-bar when it is in engagement with this nut c . The nut c has the extension c^2 , which fits into a seat within the frame, its base pressing upon the spring c' , and this extension c^2 has an arm c^3 extending outwardly through a slot in the frame into such position

as to engage with the mechanism for withdrawing the nut, as hereinafter described. For the ordinary purposes of sliding the frame back and forth on the bars on which it is mounted to disengage the nut from the screw-bar I employ the sliding bar d , having the thumb-piece d' at the upper end thereof and mounted in the lugs or bearings d^2 d^3 of the frame B, the coiled spring d^4 being confined between the lower bearing d^3 and the collar d^5 , secured by a set-screw to the bar d and extending out into position to engage with the arm c^3 of the nut c , and so draw down the nut when the sliding bar is pressed downwardly. The rod has also the collar d^6 confined thereon by a set-screw to limit its upward movement, said collar striking against the bearing d^2 .

The frame E, carrying the diaphragm F, is mounted on the frame B at e , and it may swing upwardly in said bearing, the frame E having the spring e' , which can engage with the shaft a^4 to hold the diaphragm in its raised position, as clearly shown in Fig. 3.

The frame E is formed in two parts—namely, the diaphragm-carrier F' and the rear extension E'—these two parts being connected by the bolt e^4 and being formed in two parts for convenience in securing together the different parts supported in the frame. The diaphragm-carrier F' is simply a ring having an extension f' at one end and having a seat to receive the ring f , within which the diaphragm is clamped, which ring is held therein by the set-screw f^2 , the diaphragm being supported above the recording-cylinder a . Secured to the ring f or diaphragm-carrier F' is the weight g , which is employed with the Edison reproducer, this weight being pivoted at the forward end of the ring or carrier, as shown. For the purposes of recording and reproducing I employ the lever h , having the recording-stylus i directly under the diaphragm F and having the reproducing-stylus k at the other end, this lever h being pivoted at h' to the weight g and being connected by the link i' to the diaphragm F, this link being pivoted at the forward end to the lever h just above the recording-stylus i and at its upper end to the lug i^2 , attached directly to the diaphragm. By such construction it is evident that in making the record, when the recording-stylus i is brought into position upon the recording-cylinder, the vibrations imparted to the diaphragm F are imparted directly through the link i' to the recording-stylus, said stylus being in such case supported by the bearing h' . When, however, the reproducing-stylus k at the other end of the lever is brought into contact with the cylinder, as shown in Fig. 2, the vibrations imparted by the cylinder to the stylus are transmitted through the lever h and link i to the diaphragm F, so reproducing the sound. This employment of a pivoted lever having the recording-stylus at the one end and a reproducing-stylus at the other end is one of the

main features of my invention, and the lever may of course be mounted in any suitable way, so as to give the desired result—namely, the recording of the sound and the reproduction of the sound through the same diaphragm.

For the purpose of recording, as shown in Fig. 1, it is desirable that the weight g shall be held stationary, in which case the bearing h' thereon acts as a stationary bearing for the movement of the lever in recording, and for this purpose I provide an adjusting-screw g' , passing through the diaphragm-carrier F', against which the arm g^2 of the weight g presses, this adjusting-screw g' providing for the necessary adjustment of the stylus in recording. To hold the weight g up against the screw g' , I employ the spring-bar g^3 , secured to the weight and extending forward, so as to engage with the sliding reversing-bar l , mounted in suitable guides in the frame E, as hereinafter set forth, the spring resting on the upper surface of said bar when holding the weight g up against its seat or adjusting-screw, as shown in Fig. 1, but passing down over the inclined forward end l' of the bar l , when the apparatus is reversed for reproducing and permitting the weight to swing on its pivot g^4 , so as to bring the reproducing-stylus into contact with the recording-cylinder, as shown in Fig. 2, the weight being then free to move and to hold the reproducing-stylus in contact with the recording-cylinder, as in the ordinary operation of the Edison reproducer. It will be noticed that the weight g has thereon what might be termed a "smoothing" block or bridge g^5 , which travels in front of the recording-stylus and supports the diaphragm-frame at its forward end on the recording-cylinder, raising and lowering the diaphragm-frame according to any inequalities found in the surface of the recording-cylinder. This bridge also serves the purpose of smoothing the surface of the cylinder and preparing it for the making of the record thereon, and it also acts in connection with the set-screw g' to regulate the average depth of the record made by the stylus.

It will be noticed that during the recording operation the forward end of the diaphragm-frame, which is heavier than the rear end thereof, is free to rest upon and be supported by the bridge resting on the recording-cylinder, as above stated, but that in reproducing the rear end of the diaphragm-frame is depressed and the frame is held in that position, this being necessary to bring into proper position the reproducing-needle and to permit the weight to move in its bearing to hold that needle in contact with the reproducing-cylinder. In the mechanism shown this is accomplished by means of what I have termed the "reversing-bar" l , this bar extending over the rear portion E' of the diaphragm-frame E and being mounted in guideways or bearings e^2 e^3 thereon and having at the rear end the inclined face l^2 , which engages with a like in-

5 inclined face d^7 at the base of the releasing-bar d , so that when the bar l is in its forward position, through the spring g^3 , it holds the weight g up against its seat and at the same time, as its rear inclined face does not engage with the bar d , it permits the forward end of the diaphragm-frame to descend and be supported by the recording-cylinder, as above set forth; but on the reversal of the apparatus as this reversing-bar slides back it drops the weight g , as above described, and at the same time it passes under the bar d in the frame B, as shown in Fig. 2, and presses down the rear end of the diaphragm-frame E, and so raises the forward end thereof from contact with the recording-cylinder, the inclined face l^3 of the bar l passing under the inclined end d^7 of the bar d . As the forward end of the diaphragm-frame is thus raised, it necessarily lifts the recording-stylus i from contact with the cylinder, and as the rear end of the weight g is permitted to drop it lowers the bearing h' of the lever h , and these two movements act to lower the reproducing-stylus k at the rear end of the lever h and to bring it into contact with the recording-cylinder, as shown in Fig. 2. To produce this movement of the reversing-bar l , I employ the lever m , which is located at one side of the diaphragm and within easy reach of the operator's finger, this lever being pivoted at m' and extending down through the diaphragm-holder F' , and having at its base a crank m^2 , which engages with the reversing-bar l , extending into a seat l^3 thereon. The movement of said lever m , which is shown in the two positions for recording and reproducing in Figs. 4 and 7, respectively, is all that is necessary to change the machine from recording to reproducing, or vice versa, the lever carrying a plate n , extending over an indicator-plate n' , containing the words "Recorder" and "Reproducer," so that the movement of the lever over the plate n discloses to view the name of the particular stylus which is in contact with the recording-cylinder. The two parts $F'E'$ of the diaphragm-frame E are bolted together, as above stated, in order to secure the several parts in their proper positions, and the forward end of the reversing bar l is bent to one side, as shown at l^4 , Fig. 7, so as to pass the bolt e , securing the two parts of the diaphragm together. In order to hold the reversing-bar in whichever way is desired—such as for recording or reproducing—I provide the spring-clip p , secured to the rear portion of the frame E and having the pintle p' passing through the rear bearing e^2 of the reversing-bar l and engaging with seats e^4 in the reversing-bar. It is of course desirable to protect the points of the recording and reproducing needles when not in use, as these parts are very delicate, and for this purpose it will be noticed that the recording-needle is located close to the bridge g^5 , and when the instrument is arranged for reproducing, as the weight g carrying this bar is lowered, the bridge is brought

below the stylus, and it is protected from injury. For the same purpose I form in the forward end of the reversing-bar l a notch k' , into which the point of the reproducing-stylus enters when not in use, these two delicate parts of the machine being thus protected from injury.

It is often found desirable in these machines to have the last few lines recorded upon the cylinder repeated—such, for example, as where a dictation is interrupted and the operator desires to ascertain the last sentence recorded—and as the instrument having the above-described improvement applied to it can be quickly changed from recording to reproducing, it is extremely desirable to have a means for carrying back the diaphragm a short distance, in some cases shorter than could well be accomplished by means of the hand-bar d , above described. For this purpose I provide a second or supplemental screw-bar r , which has a coarser thread upon it than the feeding-screw and might be termed a "receding" or "return" screw. This screw-bar is mounted in the machine-frame A, and has at one end thereof a gear-wheel r' , which meshes with the gear-wheel a^3 , above referred to. The screw-bar passes between the frame B and the bar d , just above the lower bearing d^3 of said frame, and extending out from the frame B are brackets s' , in which is pivoted a lever S, which extends to the forward part of the machine, as more clearly shown in Fig. 4. This lever has rigidly attached thereto an arm s^2 , which extends forward over the screw-bar r and carries at its forward end the sectional nut s , which engages with the screw-bar r , so that when the lever S is depressed the nut s will engage with the screw-bar, and by the rotation of the screw-bar will cause the frame B, and with it the diaphragm-frame E and the parts carried thereby, to be drawn backwardly. The pitch of the screw-bar and nut and the speed thereof can be regulated according to the speed to which it is desired to recede or draw back the frame B. It is evident, however, that as the nut c is normally in engagement with the main or feeding screw b before the frame can be drawn back it would be necessary to disengage the nut c from the screw-bar b . In order to prevent the stylus, either recording or reproducing, which is in contact with the recording-cylinder from scratching said cylinder and to prevent injury to the stylus, it is also necessary that the diaphragm-frame and mechanism carried by it be raised. For this purpose I provide the arm s^2 with a finger-bar t , having the finger t' , which extends over the collar d^5 , secured to the sliding bar d , and when the lever S is depressed this finger-bar acts to draw down the sliding bar d and cause it to press upon the rear end of the frame E or the rear end of the reversing-bar l , and so depress the rear end of the diaphragm-frame and raise the forward end thereof, and as the collar d^5 is drawn down it

engages with the arm c^3 of the nut c and draws it out of engagement with the feeding-screw b . A separate finger on the finger-bar t might engage with the arm c^3 , but it is not necessary. These parts are held in this position as long as the operator's finger is continued on the lever S , and the nut s held in engagement with the receding screw-bar r . As soon as the lever S is released through the spring d^4 on the sliding bar or other suitable mechanism the parts are carried into their normal position, the nut s being disengaged from the screw-bar r , the nut c caused to engage with the screw-bar b , and the regular feeding operation is resumed.

The operation of the apparatus briefly described is as follows: After the insertion of the recording-cylinder in the cylinder-holder the operator shifts the lever m until the recording-stylus is brought into contact therewith, and he talks into the tube in the same way as the phonograph is ordinarily used. If he desires to reproduce the record so made, all that is necessary is to press upon the sliding bar d , which acts by pressure upon the end of the diaphragm-frame to raise the diaphragm from the cylinder, and at the same time through the collar d^5 and arm c^3 of the nut c to disengage said nut from the feeding-screw b , and he slides the frame B backwardly on its supporting or guide arms. He can then, by simply shifting the lever m , bring the reproducing-stylus into contact with the cylinder in the manner above described when the apparatus is ready for reproducing, the shifting of the lever causing the backward movement of the reversing-bar l , which by pressing upon the base of the bar d causes the depression of the rear end of the diaphragm-frame E . raising the forward end thereof and drawing up the recording-stylus, while at the same time, through the inclined forward end of said reversing-bar, the weight g is lowered, thereby lowering the bearing h' of the lever h , and the reproducing-stylus is brought into contact with the recording-cylinder. He can thus shift from recording to reproducing by the movement of said lever and by the opposite movement of the lever shift from reproducing to recording, the movement in such case being, briefly stated, to draw forward the reversing-lever l , so permitting the rear end of the diaphragm-frame to rise and lowering the forward end thereof, so lowering the recording-stylus, and through the incline at the forward end of the reversing-bar pressing on the spring g^3 to raise the weight g and raise the reproducing-stylus away from the recording-cylinder, the weight of the forward end of the diaphragm-frame being supported on the bridge g^5 . The recording and reproducing of the sound is thus accomplished with the single diaphragm through the medium of the lever h , carrying the recording-stylus at one end and the reproducing-stylus at the other, and the necessity for separate diaphragms for this purpose

is entirely overcome, the apparatus being arranged as above described having by practical tests been shown to give as perfect results as could be desired.

For the convenience of the operator—such as where it is desired to read a few lines which have been dictated and recorded—the instrument has very great advantages, as all that is necessary is to depress the lever S , when, through the mechanism above described, the frame will be drawn back as far as is considered desirable, and by shifting the lever m from recording to reproducing the operator can ascertain what was recorded, and as soon as he reaches the end of the record can simply shift the lever m from reproducing to recording and continue his dictation to the instrument.

The instrument is for its purposes simple in construction, overcomes many of the objections to both styles of phonographs now on the market, and practically combines all their advantages and supplies many of the deficiencies in the former machines in points required for practical business use.

I do not claim, broadly, the combination, in a phonograph, with the diaphragm, of a recording-point, and a separate reproducing-point connected therewith and adapted to be brought alternately into operative relation with the same surface, as I am not the first inventor thereof.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a phonograph, the combination, with the recording-surface, of a diaphragm and a pivoted lever below the same and connected thereto and carrying the recording-stylus at one end and the reproducing-stylus at the other end, substantially as and for the purposes set forth.

2. In a phonograph, the combination, with the reproducing-cylinder, of a diaphragm above the same, and a lever pivoted below the diaphragm and having one end connected by a link to the diaphragm and provided with a recording-stylus at the end connected to said link and a reproducing-stylus at the opposite or free end, substantially as and for the purposes set forth.

3. In a phonograph, the combination of a pivoted frame carrying a diaphragm at its forward end and supported at its forward end by a bridge resting upon the recording-cylinder, and a lever pivoted under the diaphragm and having a recording-stylus at one end thereof and that end connected to the diaphragm and a reproducing-stylus at the opposite or free end, substantially as and for the purposes set forth.

4. In a phonograph, the combination of the diaphragm, the weight g , pivoted to the frame thereof and having the bearing h' , and the lever h , pivoted in said bearing and having the recording-stylus at one end thereof and that end connected to the diaphragm and the re-

producing-stylus at the other or free end thereof, substantially as and for the purposes set forth.

5. In a phonograph, the combination of the diaphragm, the weight *g*, pivoted to the frame thereof and having the bearing *h'*, the lever *h*, pivoted in said bearing and having the recording-stylus at one end thereof and that end connected to the diaphragm and the reproducing-stylus at the other or free end thereof, and means for holding said weight rigid or permitting the free movement thereof, substantially as and for the purposes set forth.

15 6. In a phonograph, the combination of the diaphragm, the weight *g*, pivoted to the frame thereof and having the bearing *h'*, the lever *h*, pivoted in said bearing and having the recording-stylus at one end thereof and that end connected to the diaphragm and the reproducing-stylus at the other or free end thereof, and the spring *g*³ and sliding bar *l*, having an inclined forward end engaging with said spring, substantially as and for the purposes set forth.

25 7. In a phonograph, the combination of the diaphragm-frame carrying the weight *g*, provided with the bridge *g*³ and having the bearing *h'*, and the lever *h*, pivoted in said bearing and connected at one end to the diaphragm and having the recording-stylus at that end and having the reproducing-stylus at the opposite or free end, substantially as and for the purposes set forth.

35 8. In a phonograph, the combination, with the pivoted lever *h*, connected to the diaphragm and having the reproducing-stylus at its free end, of the sliding bar *l*, having a notch *h'* to receive the reproducing-stylus when not in use, substantially as and for the purposes set forth.

45 9. In a phonograph, the combination of the frame B, the frame E, pivoted therein, and the sliding bar on the frame E, adapted to engage with the frame B and to press down the rear end of the diaphragm-frame E and so raise the diaphragm, substantially as and for the purposes set forth.

50 10. In a phonograph, the combination of the frame E, pivoted in the frame B, the reversing-lever *m*, and the sliding reversing-bar *l*, engaging at its forward end with the lever and having the inclined face *l*² to engage with the frame B and so depress the rear end of the diaphragm-frame, substantially as and for the purposes set forth.

55 11. In a phonograph, the combination of the frame E, carrying the diaphragm at its forward end, the weight *g*, pivoted to the diaphragm-frame, and the reversing-bar *l*, having the inclined face *l'*, acting to raise the weight *g*, substantially as and for the purposes set forth.

12. In a phonograph, the combination of the

pivoted diaphragm-frame E, the sliding reversing-bar *l*, having seat *e*⁴ therein, and the spring-clip *p*, engaging with said seat *e*⁴, substantially as and for the purposes set forth.

13. In a phonograph, the combination of a diaphragm-frame carrying thereon an indicating-plate, and a reversing-lever provided with a plate extending over said indicating-plate and acting in its movement to cover part thereof and expose part thereof, and the reversing-bar *l*, operated by said lever, substantially as and for the purposes set forth.

14. In a phonograph, the combination of the feeding-screw *b*, the nut *c*, engaging therewith and having the arm *c*³, and the frame B, having the sliding bar *d*, provided with a collar *d*⁵, engaging with said arm *c*³, substantially as and for the purposes set forth.

15. In a phonograph, the combination of the frame B, carrying the sliding bar *d*, having an inclined lower end, and the diaphragm-frame E, pivoted in the frame B and carrying the sliding reversing-bar *l*, having the inclined rear end *l*², substantially as and for the purposes set forth.

16. In a phonograph-machine, the combination of the receding screw *r*, the frame B, and the lever S, pivoted therein and having the arm *s*² rigid therewith and carrying the sectional nut *s*, engaging with said receding screw *r*, substantially as and for the purposes set forth.

17. In a phonograph, the combination of the feeding-screw *b* and its nut *c*, engaging therewith, the receding screw *r*, the frame B, and the lever S, pivoted therein and having an arm *s*², carrying the nut *s* and carrying the finger-bar *t*, engaging with and acting to withdraw the nut *c* when the nut *s* is thrown into engagement with the screw-bar *r*, substantially as and for the purposes set forth.

18. In a phonograph, the combination of the receding screw *r*, the frame B, carrying the sliding bar *d*, engaging at its base with the diaphragm-frame, and the lever S, pivoted in the frame B and having the arm *s*², carrying the nut *s*, engaging with the screw-bar *r* and having the finger-bar *t*, provided with the finger engaging with the collar *d*⁵ on said sliding bar *d*, substantially as and for the purposes set forth.

19. In a phonograph, the combination of the machine-frame A, having the shaft *a*⁴, the frame B, and the diaphragm-frame E, pivoted in the frame B and carrying the spring *e'*, engaging with said shaft *a*⁴, substantially as and for the purposes set forth.

In testimony whereof I, the said LOUIS S. CLARKE, have hereunto set my hand.

LOUIS S. CLARKE.

Witnesses:

J. N. COOKE,

ROBT. D. TOTTEN.

474946

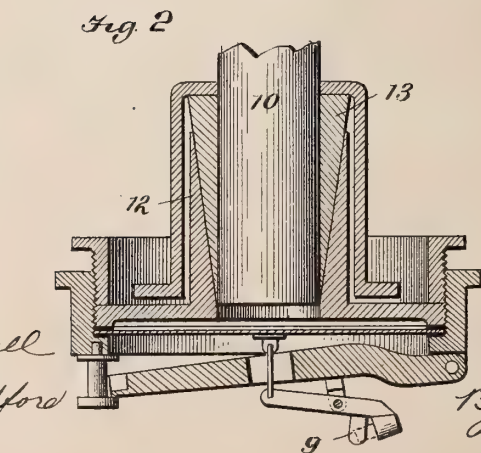
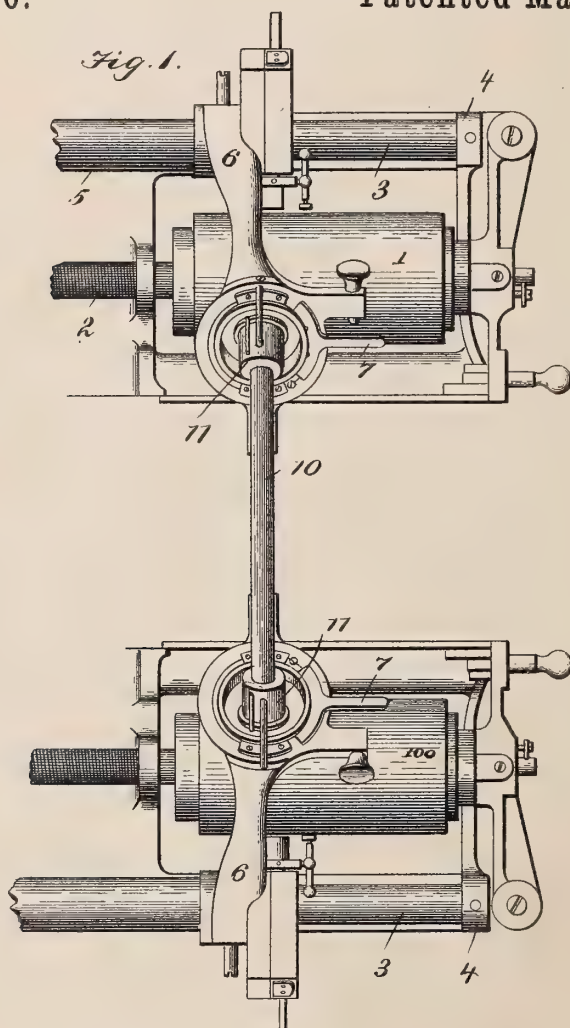
(No Model.)

L. F. DOUGLASS.

METHOD OF AND MEANS FOR DUPLICATING OR TRANSFERRING
PHONOGRAPHIC RECORDS.

No. 475,490.

Patented May 24, 1892.



Witnesses

E. P. Cornwall

Edwin L. Bradford

Inventor

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Attorney.

UNITED STATES PATENT OFFICE.

LEON F. DOUGLASS, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO
EDWARD D. EASTON, OF SAME PLACE.

METHOD OF AND MEANS FOR DUPLICATING OR TRANSFERRING PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 475,490, dated May 24, 1892.

Application filed March 17, 1892. Serial No. 425,259. (No model.)

To all whom it may concern:

Be it known that I, LEON F. DOUGLASS, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Methods of and Means for Duplicating or Transferring Phonographic Records; and I hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a new and useful method of duplicating or transferring phonographic records; and it consists, generally stated, in delivering the sound-waves emitted by the reproducing-diaphragm to a receiving-diaphragm carrying the cutting-stylus, which causes said diaphragm to move successively or in the order of the force of the sound-waves and cut like forms of sound-waves upon the receiving phonogram-blank, thus making a duplicate of the record.

A second feature of the invention resides in providing means for confining and directing the sound-waves from one diaphragm to the other.

A third feature resides in delivering the sound-waves through a channel or conduit of rarefied air or air at a reduced pressure, and, finally, in the construction and arrangement of the several parts, whereby these features are obtained, all as will hereinafter be described, and afterward pointed out in the claims.

In the accompanying drawings, forming a part of this specification, like symbols of reference refer to like parts wherever they occur, in which—

Figure 1 is a plan view showing the diaphragms in position on the respective cylinders and the flexible conduit for conducting the sound-waves from one diaphragm to the other. Fig. 2 is a cross-section through one of the diaphragms, showing the air-tight connection of the conduit therewith.

In the drawings, 1 indicates the phonogram-record, mounted upon a mandrel of any ordinary or approved construction, which is turned by the screw-shaft 2 in the usual manner.

3 is the guide-rod, mounted in supports 4,

upon which is mounted the sleeve 5, carrying the arm 6, which supports and carries the diaphragm or reproducer, said arm and its contained diaphragm or reproducer being moved along by a feed-arm (not shown) and which co-operates with the screw-shaft 3. The receiving-phonogram blank 100 is similarly mounted and operated by mechanism which may be connected with or be operated independently of the mechanism which operates the record-phonogram; but this I deem unimportant, as it forms no particular feature in this present invention.

The record diaphragm or reproducer is provided with an arm or extension 7, the function of which being to throw the reproducing-stylus 9 into or out of engagement with the phonogram-record cylinder. This arm or extension I also prefer to mount upon the receiving-diaphragm, in order that either or both diaphragms may be put into or out of engagement with their respective phonograms. I connect the reproducing and receiving diaphragms by a conduit or flexible pipe connection 10, said pipe extending through a thimble 11 and into a nose or extension 12 on the respective diaphragms.

13 indicates a conical-shaped flexible thimble or ferrule fitting tightly around the ends of the connecting-conduit 10 and into the noses 12 of the diaphragms, thus making an air-tight connection between the same and confining the sound-waves therein. I preferably rarefy or reduce the atmosphere in the conduit 10, in order to more readily transmit the sound-waves and make the diaphragms more susceptible to vibration on account of pressure of the outside air.

To reduce the air in the conduit, it is only necessary to compress the same before insertion, which will exclude a portion of the air therefrom, and the conduit will of its own assertion of elasticity resume its normal position.

I have illustrated in Fig. 1 the ordinary means of operation of the several phonograms; but I do not wish to be understood as confining myself to such construction, as it is obvious that any suitable mechanism may be substituted and employed to accomplish the same results without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The method herein described of duplicating or transferring phonographic records, which consists in delivering the sound-waves emitted by the reproducing-diaphragm in contact with the record-phonogram to a receiving-diaphragm, which actuates the cutting-stylus in contact with the receiving-phonogram blank, thereby making a copy of said sound-waves upon the receiving phonogram-blank, substantially as and for the purposes described.

2. The combination, with the record-phonogram, of a receiving-blank phonogram, a diaphragm for receiving vibrations from the record-phonogram, and a diaphragm for transmitting vibrations or sound-wave forms on the receiving-blank phonogram, substantially as and for the purposes described.

3. The combination, with the record-phonogram, of a diaphragm adapted to be vibrated thereby, a diaphragm adapted to be vibrated by the sound-waves emitted by the first diaphragm, and a receiving-blank phonogram for receiving the vibrations from the latter diaphragm, substantially as and for the purposes described.

4. The combination, with the record and receiving-blank phonograms, of diaphragms in juxtaposition thereto, provided with reproducing and cutting styli, and a conduit of rarefied air connecting the two diaphragms, substantially as and for the purposes described.

In testimony whereof I affix my signature, in presence of two witnesses, this 16th day of March, 1892.

LEON F. DOUGLASS.

Witnesses:

WM. A. EASTERDAY,
F. R. CORNWALL.

(No Model.)

2 Sheets—Sheet 1.

J. P. MAGENIS.
TELEPHONOGRAPH.

No. 476,054.

Patented May 31, 1892.

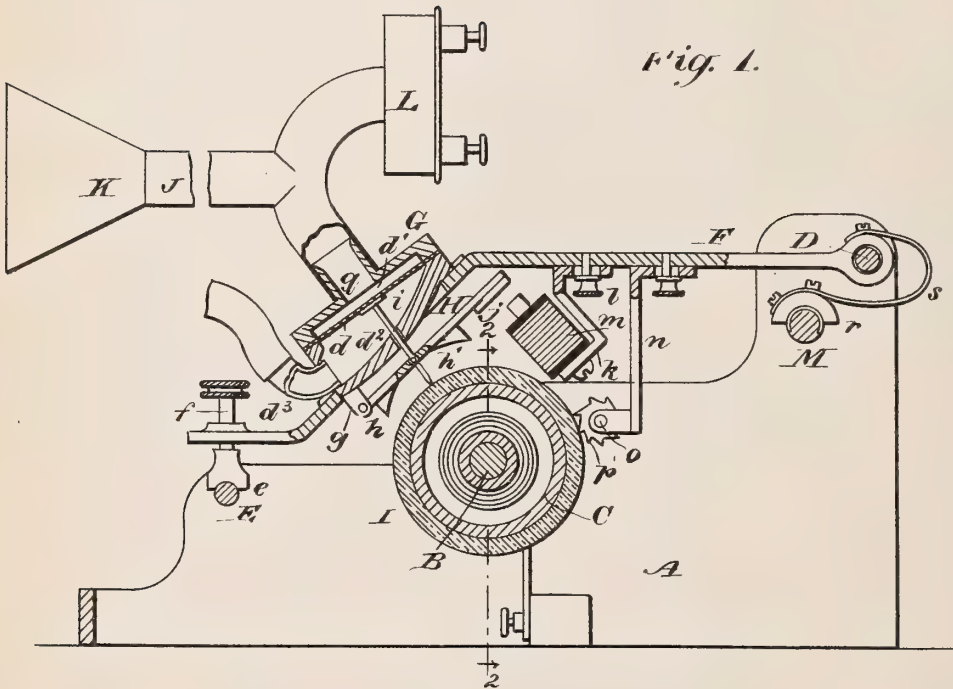
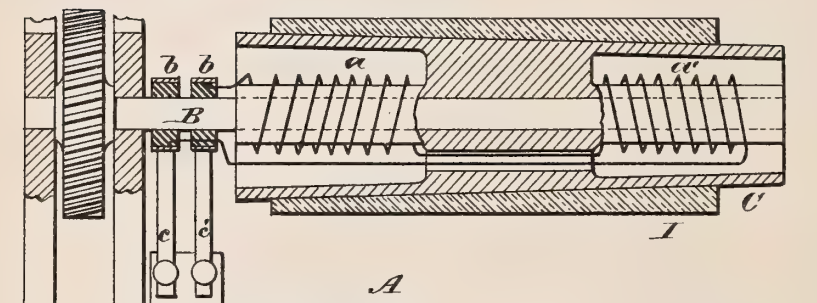


Fig. 2.



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J. P. MAGENIS.
TELEPHONOGRAPH.

No. 476,054.

Patented May 31, 1892.

Fig. 3.

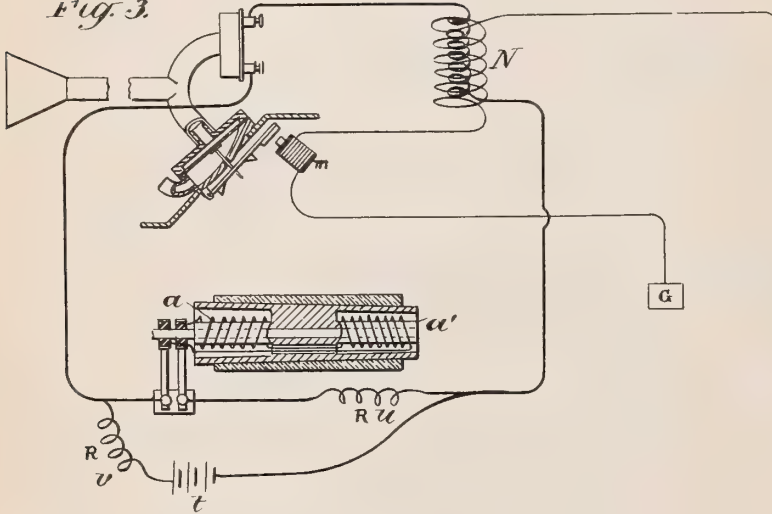


Fig. 4.

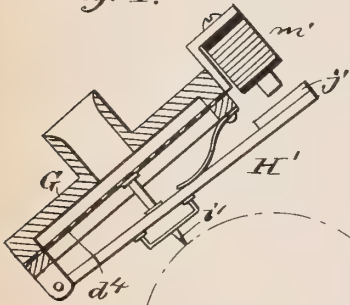
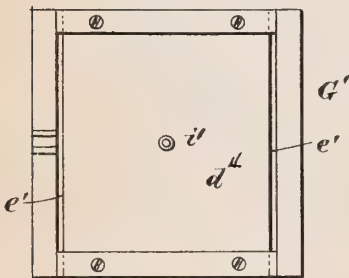
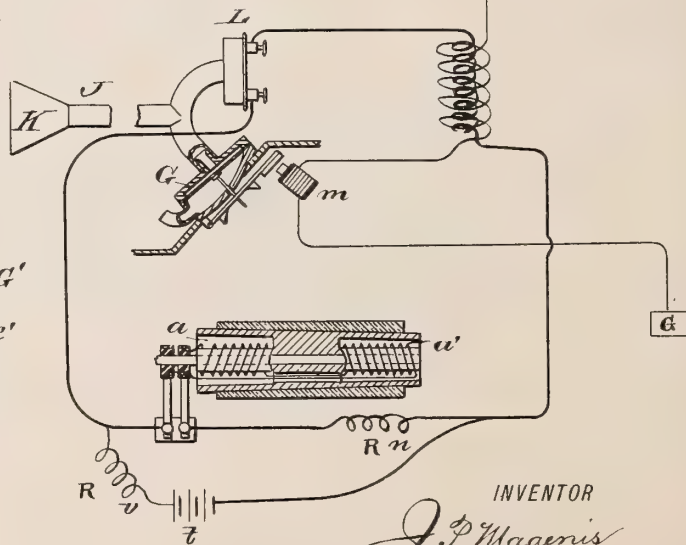


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES P. MAGENIS, OF NORTH ADAMS, MASSACHUSETTS.

TELEPHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 476,054, dated May 31, 1892

Application filed July 23, 1891. Serial No. 400,465. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. MAGENIS, of North Adams, in the county of Berkshire and State of Massachusetts, have invented a new and Improved Telephonograph, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is an end elevation, partly in section, of my improved telephonograph. Fig. 2 is a sectional elevation of the magnetic phonograph-cylinder. Fig. 3 is a diagram of the telephonograph, showing the electric connections. Fig. 4 is a transverse section of a modified form of diaphragm-cell, showing the magnet arranged above the stylus-lever; and Fig. 5 is an inverted plan view of the same.

Similar letters of reference indicate corresponding parts in all the views.

The object of my invention is to construct a combined microphone, telephone, and phonograph by means of which while the operator is telephoning to a distant station a record of the words uttered by the operator will be made upon a phonograph-cylinder at both ends of the line, so that a record may be preserved and the necessity of transmitting the phonograms from one place to another may be avoided.

My object is also to construct a magnetic phonographic cylinder by means of which the pressure of the stylus upon the record-cylinder will be augmented by magnetic attraction instead of by gravity; also, to provide means whereby the recording-stylus of the phonograph will be assisted by the microphonic and telephonic action.

My object is also, further, to provide means for cutting a groove in the phonographic cylinder preparatory to making a record by the cylinder.

My invention consists in the combination, in a phonograph, of a diaphragm-cell, a stylus-carrying lever provided with an armature, and a magnetic phonograph-cylinder arranged to act upon the armature of the stylus-carrying lever.

It also consists in the combination, with the stylus-carrying lever, of an auxiliary armature, an electro-magnet arranged to act upon the armature, and a microphone connected

with the mouthpiece of the phonograph and connected up in circuit with the distant-stylus-lever-operating electro-magnet; also, in the combination, with the stylus-carrying lever, of a telephonic magnet for assisting the diaphragm in the production of the record.

It also consists in a novel arrangement of carriage-feeding mechanism, all as will be hereinafter more fully described.

In the frame A of the phonograph is journaled a shaft B, which receives motion in any convenient way and upon the overhanging end of which is placed the phonograph-cylinder C. The said cylinder is made of magnetic material, and its ends are chambered to receive the magnet-coils $a a'$, the terminals of which are connected with the rings $b b'$, carried on the shaft B, but insulated therefrom. The current for charging the coils $a a'$ and energizing the cylinder C is taken from the contact-springs cc' , which bear upon the rings $b b'$ and are connected with the local battery in the manner presently to be described.

In the frame A are supported the rods D E, parallel with the shaft B. Upon the rod D is placed the arm F, which carries the diaphragm-cell G, containing the diaphragm d , which is clamped by its edge in the usual way. The diaphragm-cell is provided above and below the diaphragm with resonance-chambers $d' d''$. The free end of the arm F is provided with a saddle e , which is swiveled to a screw f , passing through the end of the arm F. By means of this screw the diaphragm-cell G is raised or lowered, according to the requirements. Between ears g , projecting from the under surface of the diaphragm-cell G, is fitted a stylus-carrying lever H, which is furnished with armatures $h h'$, which are within the influence of the magnetic cylinder C. To the diaphragm d is attached the upper end of the stylus i , the lower part of which is pivoted in the lever H. The stylus i is adapted to act upon the phonogram-cylinder I, carried by the magnetic cylinder C, the said cylinder C being made slightly tapering to insure the perfect fitting of the phonogram-cylinder I. The lever H is prolonged beyond the diaphragm-cell and provided with an armature j , which is held

within the field of an electro-magnet *m*, attached to the arm *F* by means of the bracket *k* and the clamping-screw *l*, the said bracket having an elongated opening for the screw to permit of adjusting the magnet *m* along the length of the arm *F*, as may be required. The magnet *m* may be either a polarized or a plain electro-magnet. When a polarized magnet is required, the core of the magnet and the bracket *k* for supporting the same are made of steel tempered and magnetized. To the arm *F* is also adjustably secured a bracket *n*, provided at its lower end with bearings, in which is journaled a shaft *o*, carrying a cutter *p*, which is narrower than the stylus, for forming a groove in the surface of the phonogram-cylinder *I*, the said groove being formed in the path of the stylus *i*, so that when the said stylus makes its record it will be formed principally at the edges of the groove. The cutter *p* is rotated by connection with any rotating part of the phonograph.

The tube *J*, connected with the mouthpiece *K*, is branched, one end thereof being in communication with the central aperture *q* of the diaphragm-cell *G*, the other end being connected with the microphone *L*, which may be of any approved construction, and will not, therefore, require a special description.

In the frame *A* is journaled a feed-screw *M*, to which is fitted a half-nut *r*, connected with the arm *F* by a bowed spring *s*. The screw *M* is located below and slightly in front of the rod *D*, so that when the arm *F* is raised it will disengage the half-nut *r* from the screw and will re-engage it as the arm is lowered.

The microphone *L* is connected up in the local telephone-circuit, as shown in Fig. 3, with the battery *t* and primary wire of the induction-coil *N*, and the coils *a a'* of the magnetic cylinder *C* are in the shunt-circuit. The amount of current sent through the coils *a a'* of the cylinder *C* is regulated by the variable resistance *u*, and the amount of current sent through the microphone is regulated by the variable resistance *v*. The secondary wire of the induction-coil *N* is connected with one terminal of the magnet *m*, the remaining terminal of the said magnet being connected with the ground, as shown. The other terminal of the secondary wire of the induction-coil *N* is connected with the line-wire, which leads to the secondary wire of the induction-coil of a similar instrument at a distant station and through the said induction-coil to the magnet *m* and the ground, as in the first instance.

When sounds are uttered in the mouthpiece *K*, the diaphragm *d* in the cell *G* is vibrated and a record is produced upon the phonogram-cylinder *I* while it is rotated, and at the same time the diaphragm of the microphone is vibrated, transmitting impulses to the distant station, which, acting upon the magnet *m*, cause the stylus-carrying lever *H* to vibrate and produce a record upon the distant

phonogram-cylinder similar to that which is produced at the transmitting-station. In addition to the effect thus described, the magnet *m* assists the voice in producing the record at the transmitting-station.

Instead of simultaneously transmitting speech by the microphone and making a record by means of the phonograph at the transmitting-station, a phonogram may be placed on the cylinder *C* and made to vibrate the diaphragm *d*, and the vibrations thus produced may be transmitted to the microphone through the branched pipe *J*, and the message may thus be transmitted to a distant station. The resonance-chamber *d²* is provided with a tube *d³*, which is connected with a stethoscopic ear-tube. The operator may transmit speech and hear by the use of the stethoscopic tube. As the instruments at opposite ends of the line are exactly alike, a description of one will suffice for both.

In the modifications shown in Figs. 4 and 5 the diaphragm *d¹* in the cell *G'* is rectangular in form and is bound only at its ends, leaving the spaces *e'* at its edges. In ears projecting from the diaphragm-cell *G'* is pivoted a lever *H'*, connected with the diaphragm and carrying a stylus *i'*. An electro-magnet *m'*, supported by the diaphragm-cell above the lever *H'*, acts upon an armature *j'*, carried by the said lever.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a telephonograph or phonograph, the combination of a record-cylinder, a recording and reproducing stylus or styluses, a magnetic cylinder, and a stylus-operating lever furnished with one or more armatures held in the field of the magnetic cylinder, substantially as specified.

2. In a telephonograph or phonograph, the combination, with the mouthpiece and stylus-carrying lever of a phonograph, of an armature attached to the stylus-carrying lever, an electro-magnet adapted to act upon the armature, and a microphone attached to the phonograph mouthpiece and connected up in an electric circuit with the stylus-lever magnet, substantially as specified.

3. In a telephonograph or phonograph, the diaphragm-supporting arm, the guide-rod for supporting one end of the same, the feed-screw, the curved spring attached to the arm, and the half-nut carried by the curved spring and adapted to engage the screw when the diaphragm-supporting arm is in the position of use, substantially as specified.

4. In a telephonograph or phonograph, the combination, with the diaphragm-carrying arm *F*, of the adjusting-screw *f*, the saddle *e*, swiveled to the adjusting-screw, and the guide-rod *E*, substantially as specified.

5. In a telephonograph or phonograph, the combination of a rectangular diaphragm bound at the ends and free at the edges, an

electro-magnet, and a lever carrying a stylus and armature and adapted to be operated by the joint action of the diaphragm and electro-magnet, substantially as specified.

5 6. In a telephonograph or phonograph, the combination of the magnetic cylinder C, the stylus-carrying lever H, provided with the armatures *h*, *h'*, and *j*, the magnet *m*, the microphone or transmitter L, and the battery and
10 line connections, substantially as specified.

7. The combination, in a telephonograph or phonograph, of a magnetic record-cylinder, a vibratory diaphragm carrying a recording-stylus, and an armature connected with the
15 stylus and supported in the field of the mag-

netic record-cylinder, substantially as specified.

8. In a telephonograph or phonograph, the combination, with the phonograph-diaphragm and recording-stylus, of a microphone arranged to be operated simultaneously with the phonograph-diaphragm, armatures connected with the recording-stylus, and an electro-magnet arranged to act upon the said armature and placed in the circuit of the distant microphone, substantially as specified.

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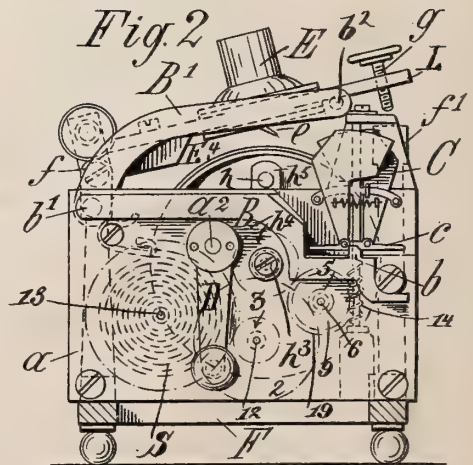
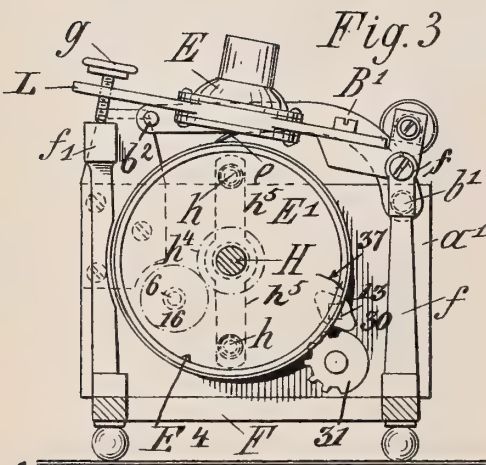
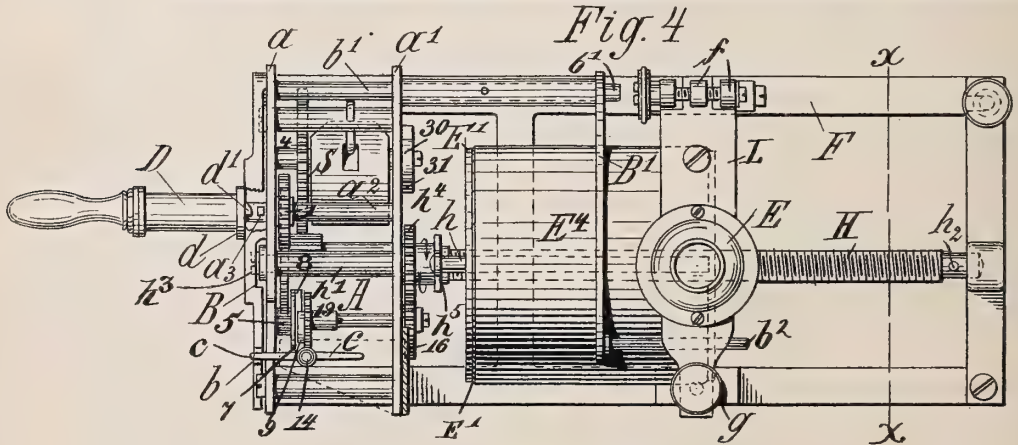
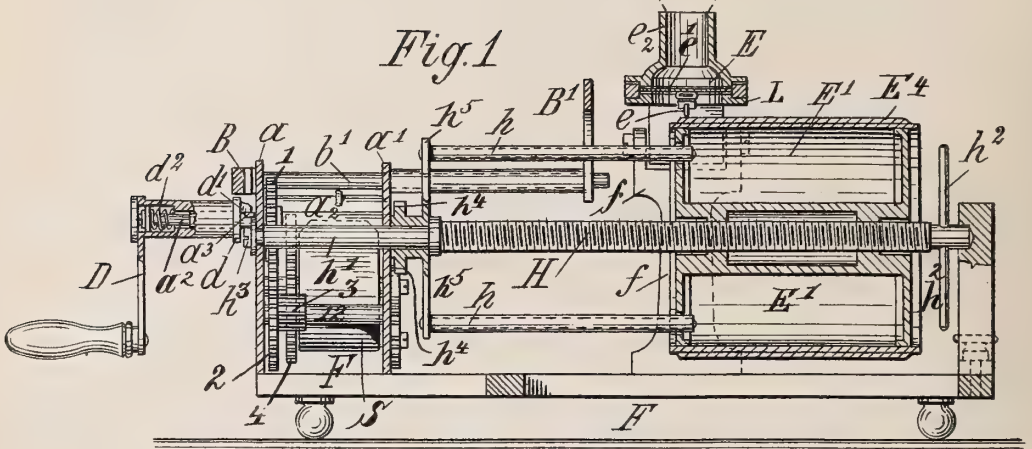
(No Model.)

3 Sheets—Sheet 1.

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No. 479,431.

Patented July 26, 1892.



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Fig. 5

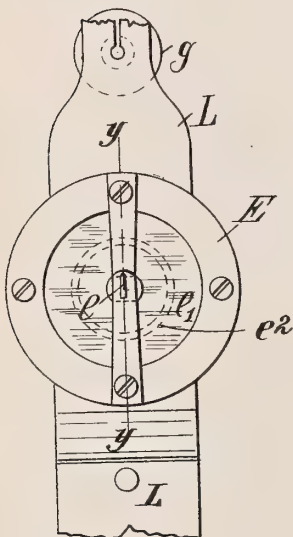


Fig. 6

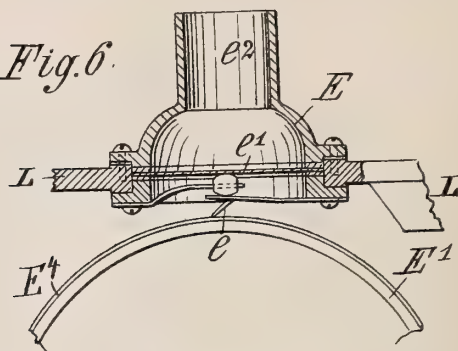


Fig. 8

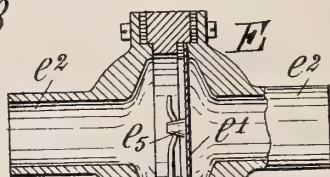
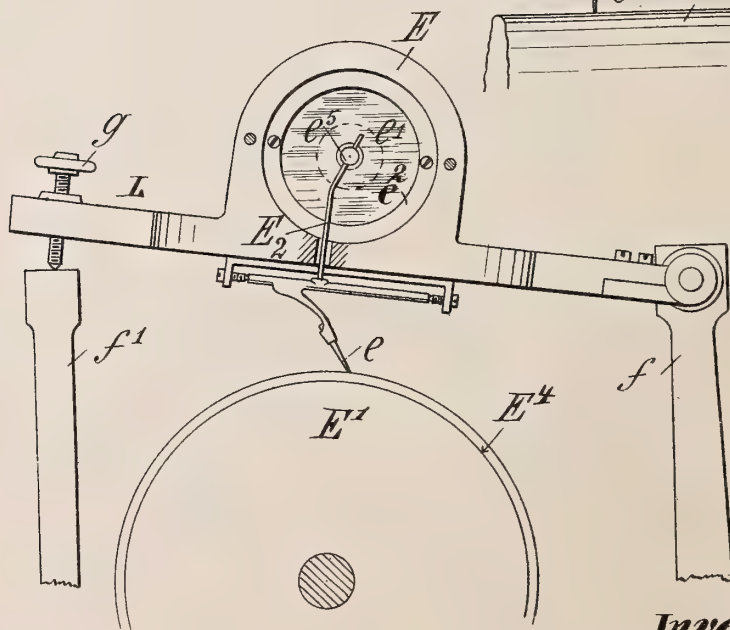
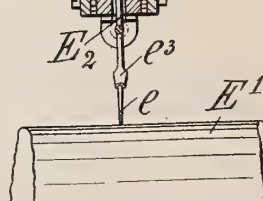


Fig. 7



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(No Model.)

3 Sheets—Sheet 3.

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Fig. 11

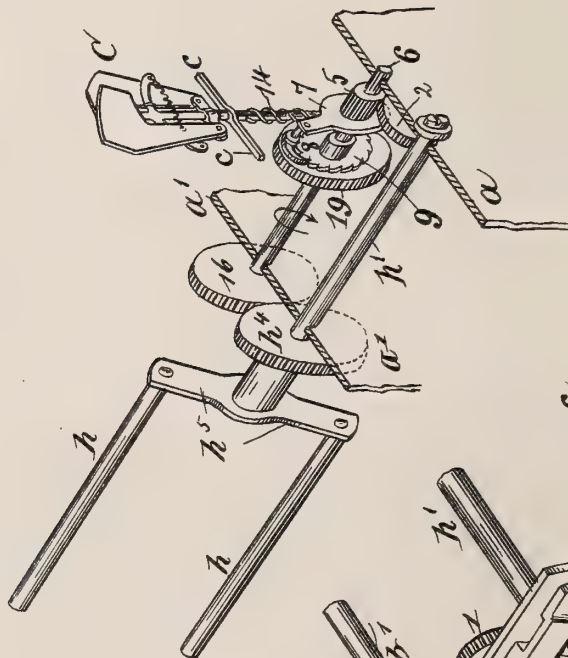


Fig. 10

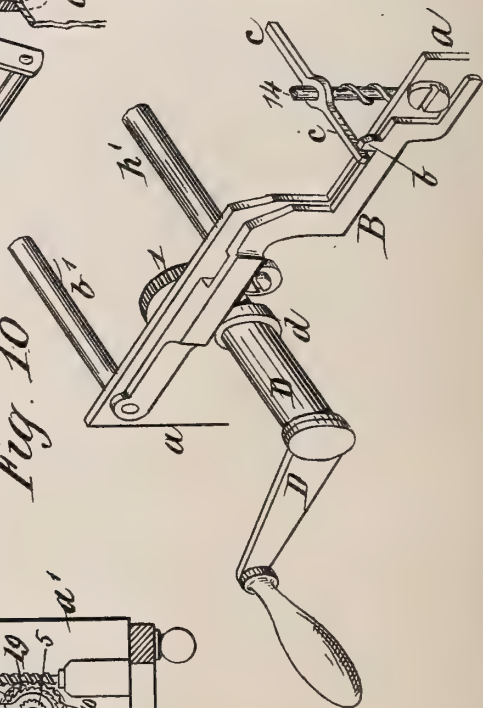
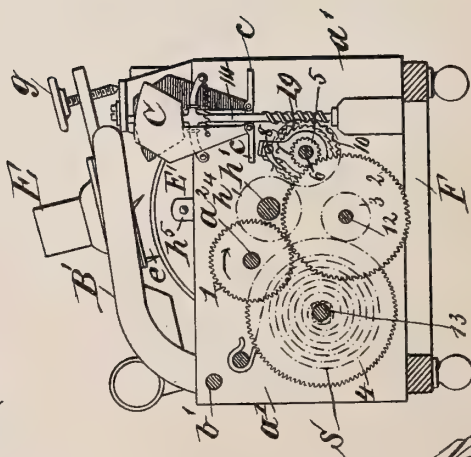


Fig. 9



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PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 479,431, dated July 26, 1892.

Application filed July 11, 1891. Serial No. 399,190. (No model.)

To all whom it may concern:

Be it known that I, VINZENZ LAHOLA, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Phonographs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to phonographs, and has for its object certain improvements applicable to phonographs in which the phonogram-carrier is driven by a spring or like motor requiring to be wound up, and certain improvements applicable to phonographs generally.

The invention consists in structural features and in combinations of co-operative elements, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view, Fig. 2 a left-hand end elevation, Fig. 3 a cross-section on line *xx* of Fig. 4, and Fig. 4 a top plan view, of a phonograph embodying some of my improvements. Fig. 5 is an under side view of the producer or reproducer and part of its supporting-lever. Fig. 6 is a sectional view thereof, taken on line *yy* of Fig. 5. Fig. 7 is a sectional elevation illustrating my improvements in the construction of the producer or reproducer and its arrangement relatively to the blank or phonogram cylinder carrier, and Fig. 8 is a sectional view thereof. Fig. 9 is a sectional end elevation of the phonograph, showing the motor. Fig. 10 is a perspective view of the stop mechanism for the motor governor or fly, and Fig. 11 is a like view of a portion of the motor.

Similar symbols indicate like parts wherever such may occur in the above-described figures of drawings.

The carrier for the phonogram-blank or for the phonogram may be revolved by any suitable motor, and in the drawings I have shown a spring-motor, with which I have combined

means whereby the revolution of the carrier is automatically stopped as soon as the motor is about to run down and whereby the overwinding of the motor-spring is avoided.

Referring more particularly to Figs. 2, 9, 10, and 11, on the winding-arbor a^2 is secured a gear-wheel 1, that meshes with a wheel 2 on an arbor 12, which latter also carries a pinion 3 in gear with a wheel 4 on the arbor 13 of the motor-spring S, whose ends are respectively secured to said arbor 13 and to a pin secured to the frame-plates *a* and *a'*. By means of the described gearing the spring S is wound up by the revolution of the arbor a^2 . The gear-wheel 2 also meshes with a pinion 5 on an arbor 6, which latter carries a radial arm 7, that has pivoted thereto a pawl 8 in perpetual engagement with the teeth of a ratchet-wheel 9, formed integral with or rigidly secured to a worm-wheel 19, in gear with an spirally-threaded portion of the governor or fly spindle 14. The ratchet 9 and worm-wheel 19 are loosely mounted on arbor 6, which latter also carries a pinion 16, in gear with a pinion h^4 on arbor h' , that carries the radial arms h^5 , to which the rods *h*, that revolve the blank or phonogram carrier, are secured, as hereinafter explained. It will thus be seen that when the motor-spring S is wound up the arbor 6 will be revolved, thereby revolving the blank or phonogram carrier, returning the same to its starting-point. Inasmuch as the ratchet-wheel 9 and worm-wheel 19 are loosely mounted on the arbor, and inasmuch as the spindle 14 for the governor or fly of the motor is locked against rotation during said winding up, as will be described presently, the pawl 8 will ride idly over the teeth of ratchet 9, the arbor 6 revolving in the direction of the arrow, Fig. 11.

The winding-arbor a^2 has a radial lug a^3 , Figs. 1 and 4, and has its outer end attenuated. On the attenuated end of the arbor a^2 is mounted a coiled spring d^2 , that has bearing upon a collar at the end of said attenuated portion of the arbor and upon an annular shoulder formed within the barrel of the winding-key D, said barrel having at its end a flange or collar *d*, from the inner face of which projects a lug d' , adapted to engage the lug a^3 on arbor a^2 and carry the same along

when the key is revolved. As is readily seen, the spring d^2 on arbor a^2 tends to move the key D, with its lug d' , into engagement with the lug a^3 on arbor a^2 , thereby insuring the revolution of the latter arbor when the lugs are in engagement and the key is revolved in the proper direction for the purpose of winding up the motor-spring S. When the motor is in operation, however, the lug d' on key D is held out of engagement with the lug a^3 on arbor a^2 , as will be described.

The arbor for the motor-spring, as well as all the arbors for the train of gearing described, have their bearings in frame-plates a and a' , and in said plates is also pivoted a shaft b' , that serves as a fulcrum for two levers B and B', respectively. The lever B is secured to the shaft b' at the left end outside of the end frame plate a in such a position as to lie on the collar d of the winding-key when said key has been moved inwardly to bring its lug d' into engagement with the lug a^3 on the winding-arbor a^2 whenever it is necessary to wind up the motor-spring, or said lever B may be interposed between the collar d and frame-plate a to hold the said lugs out of engagement with each other when the motor is running.

The lever B has near its free end a projection b , and on the spindle 14 of the governor or fly of the motor are secured two radial arms $c c$.

When the lever B is interposed between the collar d of the winding-key and the frame-plate a , the motor is free to operate, the projection b on lever B then occupying a position below the arms $c c$. When, however, it is desired to stop the motor, either for the purpose of winding up the motor-spring S, or for any other purpose, the lever B is lifted from between the collar d and frame-plate a sufficiently to allow the key D to be moved toward said frame-plate, so that the lever B will rest on said collar, in which position the projection b on said lever will lie in the path of the arms $c c$ on the governor-spindle and arrest the motion thereof, and consequently the operation of the motor, as will be readily understood and as can be clearly seen by an inspection of Figs. 2, 5, 9, 10, and 11.

In order that the motor may be automatically stopped when the motor-spring S is nearly unwound and in order to avoid overwinding of said spring, the arbor 13 of the spring carries a double-toothed cam 30, Fig. 3, whose teeth alternately engage the teeth of mutilated gear 31 as the spring-arbor revolves, thereby revolving the said mutilated gear also, the number of teeth on the gear being such that after a given number of revolutions of the arbor 13 in one or the other direction one of the teeth of the cam 30 will impinge upon the untoothed portion of the mutilated gear, whereby the further rotation of the arbor 13 is prevented, but said arbor is free to revolve in an opposite direction. Supposing that the spring is unwound, or

nearly so, when the cam 30 and gear 31 are in the relative positions shown in Fig. 3, it is obvious that said arbor is held against rotation in the direction of arrow 37, but not in a reverse direction, so that said spring may be wound up, and when nearly fully wound one of the teeth of cam 13 will again come in contact with the untoothed portion of the gear to prevent the arbor 13 from further rotation.

By the devices described the motor is automatically stopped as soon as the motor-spring is unwound or wound up again, while the said motor may be locked against operation at any time through the medium of the lever B, by means of which the winding-key is also thrown out of operation.

The blank or phonogram carrier cylinder E' has screw-threaded bearings and is mounted on a correspondingly-threaded shaft H, as usual, the unthreaded left end h' of which has its bearings in the motor-frame plates a and a' , said unthreaded portion having an interiorly-threaded socket in its end for the reception of a locking or binding screw h^3 , Fig. 2, by the loosening of which screw the shaft may be adjusted about its axis, for purposes hereinafter explained, the shaft being provided with suitable handles h^2 .

On the shaft H is loosely mounted the pinion h^4 , from whose hub project two radial arms h^5 , to each of which is secured a rod h , hereinbefore referred to, that extends through suitable holes in the left-hand head of the carrier-cylinder E', the said pinion being driven by the winding-up gear, so that in winding the motor-spring the carrier E' is returned to its normal position—that is to say, from its position shown in Fig. 1 to its position shown in Fig. 4.

The producer and reproducer E is secured to a lever L, that is fulcrumed or pivoted to a post f , rising from the main frame F of the phonograph, and carries at its outer end an adjusting-screw g , by means of which the degree of contact between the producing or reproducing point e and the blank or phonogram cylinder is regulated. In winding up the motor-spring it is desirable that this contact should be interrupted to avoid wear of the record, and to this end the shaft b' carries at its right-hand end the lever B', hereinbefore referred to, from the free end of which projects a pin b^3 , that extends under the outer or free end of the producer and reproducer carrier-lever L.

It will readily be seen that when the lever B is lifted onto the flange d of the key-barrel the lever B' is also lifted, thereby lifting lever L and the producer or reproducer and interrupting the contact between the point or style e and the blank or phonogram cylinder E'. On the other hand, when the key D is drawn outwardly against the stress of its spring to disengage the lug d' from the lug a^3 on the winding-arbor the lever B, as well as the lever B', drop, thereby starting the mo-

tor and re-establishing the contact between the point or style e and the blank or phonogram cylinder, said lever B preventing the key D from again moving inward, thus allowing the motor to drive the carrier E' until said lever B is again lifted or until the motor has run down. It is therefore not possible to arrest the motor and wind the motor-spring without interrupting the contact between the blank or phonogram cylinder and the point e or start said motor without re-establishing the contact.

In phonographs as heretofore constructed the driving-shaft that drives the blank or phonogram cylinder or that moves the producing or reproducing point has about one hundred threads to the inch to avoid loss of space. It is not only very difficult and tedious to cut so fine a thread, but as a rule these driving-shafts have been made very slender and comparatively short to avoid any deviation thereof from a straight line. It is of course desirable, especially when the carrier is moved longitudinally instead of the producer or reproducer, to provide a sufficiently-strong supporting-shaft, and to avoid the necessity of cutting a very fine thread on such a shaft I make the same adjustable about its axis, so that the blank or phonogram cylinder may be properly adjusted for the production or reproduction of the phonogram tracks or threads between the track or thread of a phonogram traced thereon. By these means any desired pitch within certain limits may be given to the screw-thread on the shaft H, so that in producing or reproducing a phonogram after a line or thread of the record has been produced or reproduced a partial revolution may be imparted to the shaft H, while the carrier remains stationary, so that the producing or reproducing point will register with the space between the first record track or thread, and this may be repeated as many times as the space between the first record track or thread will permit. I am thus enabled to obtain with a comparatively coarsely-threaded shaft a record the tracks of which are as close together if not closer than those obtained with a finely-threaded shaft, as will be readily understood.

In phonographs as heretofore constructed the producer or reproducer has been arranged so that the producing or reproducing diaphragm lies in a plane tangential to the blank or phonogram cylinder, the sound being transmitted to and from one side of said diaphragm. I have found that the vibrations of the diaphragm in producing and the reproduction of the sound in reproducing can be greatly intensified by transmitting the sound to and from both sides of the diaphragm, and this arrangement I have shown in Figs. 7 and 8.

The producer or reproducer E, as shown, is arranged with its longitudinal axis parallel with the shaft H, and consequently parallel with the longitudinal axis of the blank or phonogram cylinder, the diaphragm e' being

secured in the casing, so as to lie in a plane at right angles to the shaft H, said casing being provided with two branches $e^2 e^3$, leading to the opposite sides of the diaphragm for the connection of the mouth or ear piece or pieces. In producing, the connecting-tube will be provided with two branches leading to a single mouthpiece, while in reproducing, two tubes, each provided with an ear-piece, may be connected with the branches e^2 instead of a branched tube, as has been the case heretofore. In this manner the sound has been transmitted to or from both sides of the diaphragm, the vibrations or sound reproductions of which being greatly intensified, the reproduced sounds being more distinct, clear, and sharp than is the case with a reproducer arranged as usual.

The vibrations of the diaphragm e' , instead of being transmitted directly to the producing-point, as is the case in phonographs as now constructed, are transmitted to an intermediate element—as, for instance, a rock-shaft—to which the producing or reproducing point is secured and which may be called the “point-holder,” which shaft or holder is adapted to be oscillated or rocked by the diaphragm. The holder, as shown, is centered on cone-screws and connected with the diaphragm by a connecting rod or wire E^2 , secured in a button e^5 , attached centrally to said diaphragm, said holder having an arm provided with a sleeve for the reception of the producing or reproducing point e , said sleeve being made tapering, so that the point may be firmly pressed into and held therein. It is obvious that the point e may be directly connected with and vibrated by the diaphragm e' ; but the provision of a holder for the point admits of the interchangeable use of producing and reproducing points. This feature is of great importance in such cases where the record is to be repeatedly reproduced, as it is well known that if the producing-point is used for reproducing the record the latter will soon wear away and be obliterated entirely. If, however, a reproducing-point narrower than the record track or thread is employed this is not the case, as the sounds will be reproduced provided the point is in contact with the bottom of the track, so that if the latter is made comparatively wide—as, for instance, by a chisel-point—and a pointed reproducing-point is used there is not only considerable margin for adjustment, but the track is not so liable to be obliterated. In these adjustments the advantages of supporting the producer and reproducer from a lever and providing the adjusting-screw g will be readily understood.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a phonograph, the combination, with the blank or phonograph cylinder carrier, of a producer or reproducer arranged above said carrier and comprising a casing, a diaphragm

arranged therein with its axis parallel to the axis of rotation of the cylinder, two sound-ducts leading to opposite sides of the diaphragm, a stylus-carrier adapted to rock in bearings on the under side of said casing, said stylus-carrier being connected with the diaphragm by an arm E^2 , a hinged support for said producer or reproducer, and an adjusting device for adjusting the same relatively to the phonograph-carrier, substantially as and for the purpose set forth.

2. The combination, with a revoluble carrier for the blank or phonogram cylinder, said carrier being provided with interiorly-threaded bearings, of a stationary screw-shaft adjustable about its own axis, for the purpose set forth.

3. The combination, with the blank or phonograph carrier, its motor, the producer or reproducer arranged above said carrier, and a hinged support for said producer or reproducer, of two connected levers adapted to stop the motor and simultaneously lift the producer or reproducer support from the carrier.

4. The combination, with the blank or phonogram cylinder carrier, its motor, and the producer or reproducer, of two levers adapted to operate jointly to stop the motor and move the producer or reproducer away from the carrier, for the purpose set forth.

5. The combination, with the blank or phonogram carrier, its motor, the winding-shaft thereof, the winding-key having endwise motion on the shaft, and interlocking devices connected with the shaft and key to interlock the same, of a lever having bearing on the winding-key at or about at its point of interlocking with the winding-shaft and adapted to drop on said winding-shaft when the key is moved out of engagement therewith, said le-

ver being provided with a projection in the path of the governor or fly of the motor when said lever rests on the winding-key, for the purposes specified.

6. The combination, with the blank or phonogram carrier, its motor, the winding-arbor thereof, the winding-key having endwise motion on the shaft, interlocking devices connected with the shaft and key to interlock the same, and the producer or reproducer, of a lever having bearing on the winding-key at or about at its point of interlocking with the winding-shaft and adapted to drop on said winding-shaft when the key is moved out of engagement therewith, said lever being provided with a projection in the path of the governor or fly of the motor when said lever rests on the winding-key, and an auxiliary lever actuated by the motor-locking lever and adapted to hold the producer or reproducer away from the carrier when said motor-locking lever rests on the winding-key, for the purpose set forth.

7. The combination, with the producer or reproducer, the motor-governor, the winding-shaft of the motor, provided with a radial lug or projection a^3 , and the key D, provided with a flange d and a lug or projection adapted to engage the radial lug a^3 , and a spring exerting its power to hold said lugs in engagement, of the lever B, provided with the lug or projection b , the lever B', provided with the pin b^2 , and a fulcrum common to both levers, for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

VINZENZ LAHOLA.

Witnesses:

W. B. MURPHY,
CARL ZOUETS.

(No Model.)

T. A. EDISON.
PROCESS OF DUPLICATING PHONOGRAMS.

No. 484,582.

Patented Oct. 18, 1892.

Fig. 1

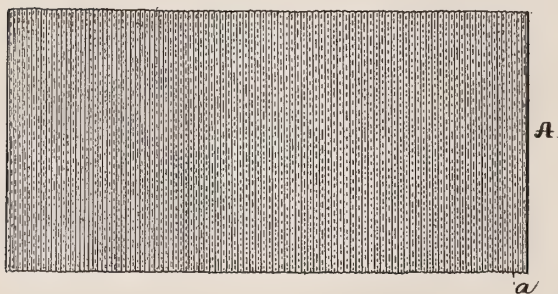


Fig. 2.

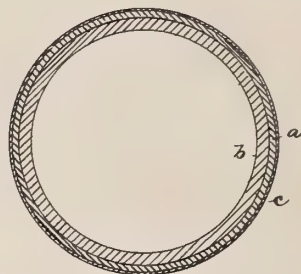


Fig. 3.

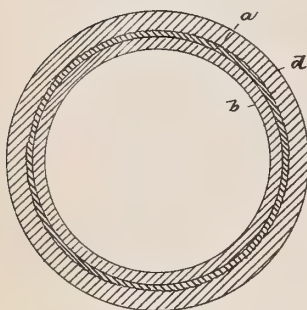


Fig. 4.

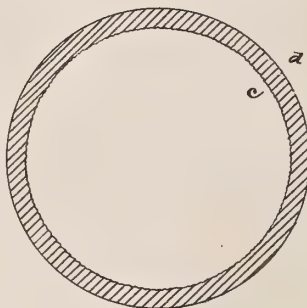


Fig. 5.

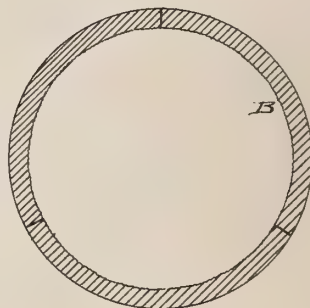


Fig. 6.

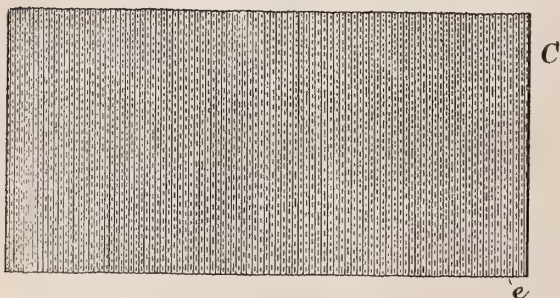
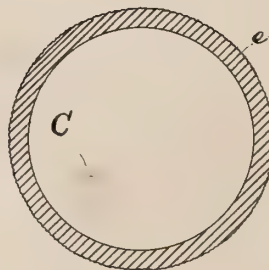


Fig. 7.



Witnesses
E. L. Howard
William P. Eger

Inventor
Thomas A. Edison,
By his Attorney Dyer & Seely

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO
THE EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 484,582, dated October 18, 1892.

Original application filed January 5, 1888, Serial No. 259,895. Divided and this application filed January 30, 1888. Renewed March 30, 1892. Serial No. 427,011. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Process for Duplicating Phonograms, (Case No. 751,) of which the following is a specification.

The object I have in view is to produce a practical process for the duplication of phonographic records, so that the new art of phonographic publication can be established. Generally I propose to construct a suitable matrix, preferably in metal, and by its use mold duplicate phonograms with the phonographic records thereon, such phonograms or the surface thereof being preferably constructed of a material too hard for the satisfactory indentation thereof by the phonograph-recorder; but the duplicate phonograms may be made of a softer material. For the construction of the matrix I employ the process of vacuous deposit described in my application, Serial No. 118,942, filed January 28, 1884. The original phonogram is preferably constructed with a surface of wax or a similar material. This is placed in a suitable phonograph and the phonographic record produced thereon. The phonogram so impressed with the phonographic record is placed in a high vacuum, in which an electric arc, continuous or discontinuous, is produced between electrodes of metal or in which metal vapor is otherwise produced. The electric arc produces a vapor of the metal of which the electrodes are composed, which vapor or a metallic vapor otherwise produced within said chamber is deposited on the indented surface of the phonogram, forming a layer of metal thereon, which follows accurately all the indentations of the record, however minute, owing to the highly-communited condition of the metal deposited. The phonogram while the deposit is taking place in the vacuum-chamber is revolved slowly by a suitable power connection, and this is especially necessary when the form of the phonogram is cylindrical, which it preferably is. The vacuous deposit is continued until the layer of metal is sufficiently thick, when the covered phonogram is removed from the vacuum-chamber and is further

covered by a more rapid process to give strength and body to the covering. A further covering of metal may be produced by electroplating a metal upon the vacuous deposit in the usual manner of electroplating, or the vacuous deposit may be backed up by casting upon it type-metal or other metal or alloy having a lower fusing-point than the vacuous deposit, or this may be done after electroplating upon the vacuous deposit, or the vacuous deposit may be backed up by a cement or gum or by plaster-of-paris; but a metal backing is preferred. The material of the original phonogram is then dissolved off of the metal covering, leaving in the case of cylindrical phonograms a hollow metal cylinder or one internally faced with metal, carrying the phonographic record in relief upon its inner surface. This metal cylinder is then split longitudinally by a very thin saw into a number of parts—say, for illustration, three parts—which are suitably mounted upon levers, so that a mold is formed, which can be closed to receive the material to be molded and opened to permit of its being taken out. The duplicate phonograms are produced by means of this mold by pouring therein and preferably around a suitable core placed in the mold suitable substances, such as wax or wax-like material, resin, or plaster-of-paris, the material being preferably too hard to be satisfactorily indented by the phonograph, or the duplicate phonograms may be made by taking sheets of smooth material, like waxed paper or tin-foil, and pressing them upon the surface of the mold by a plunger or otherwise, the sheets being afterward backed up by a wax, resin, or cement. The latter way of making the duplicate phonograms is especially applicable to flat-surface phonograms, although it may be used for phonograms with cylindrical surfaces. The production of the first layer of metal upon the phonograph-record by means of the vacuous deposit has great advantages over doing this by electroplating. In electroplating the wax-surface must first be covered by plumbago or gold-leaf or silver salts reduced by chemical reagents in order to form a conducting basis for the plating. The plumbago and gold-leaf do not bring out the fine

vibrations and produce rough reproductions while the silver salts do not run well on the wax surface. The vacuous deposit, however, adheres uniformly to the wax surface and reproduces the record with great perfection.

The invention is illustrated for convenience in connection with a cylindrical phonogram.

In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of an original phonogram; Fig. 2, a cross-section of the original phonogram with a thin vacuous deposit thereon; Fig. 3, a view similar to Fig. 2, with a further backing; Fig. 4, a view the same as Fig. 3, with the original phonogram dissolved out; Fig. 5, a sectional view of the divided mold or matrix; Fig. 6, an elevation of a duplicate phonogram produced by the mold, and Fig. 7 a cross-section of such duplicate phonogram.

A is the original phonogram, having a relatively-soft wax or wax-like surface *a* and the backing of harder material *b*, or it may be entirely of wax. The phonographic record is produced upon the surface *a*. The metallic vacuous deposit is shown at *c*, and the further backing, preferably of metal, is shown at *d*.

B is the divided mold, produced as has been stated and having the phonographic record in relief.

C is the duplicate phonogram, produced by the mold and having a surface *e*, indented with the phonographic record and preferably of harder material than could be practically or satisfactorily indented directly by the phonograph.

My invention herein is limited to constructing the matrix or mold by covering the phonograph-record by a vacuous deposit.

The broad invention of duplicating phonograph-records and of producing matrices for that purpose, not limited to the use of the vacuous deposit as a step in the process of reproducing the phonographic record or constructing a matrix for that purpose, is not claimed herein, such broad subject-matter being covered by an application for patent filed

by me January 5, 1888, Serial No. 259,895, of which this specification is a division.

What I claim is—

1. The process of forming a matrix or mold for the duplication of phonographic records, consisting in covering the phonograph-record with a deposit of metal by vaporizing metal in a vacuum in which the record is placed, substantially as set forth.

2. The process of forming a matrix or mold for the duplication of phonographic records, consisting, first, in indenting the original record on a phonogram; second, covering the recording-surface of such phonogram with a deposit of metal by vaporizing metal in a vacuum in which such phonogram is placed, backing up such deposit to give it strength, and then removing the original phonogram, substantially as set forth.

3. The process of forming a matrix or mold for the duplication of phonographic records, consisting, first, in indenting the original record upon a phonogram having a wax-like surface; second, covering the recording-surface of such phonogram with a deposit of metal by vaporizing metal in a vacuum in which such phonogram is placed, backing up such deposit to give it strength, and then removing the original phonogram, substantially as set forth.

4. The process of duplicating phonograms carrying a phonographic record, consisting, first, in indenting the original record upon a phonogram; second, constructing a matrix or mold of such original record by depositing thereon a coating of metal by vaporizing metal in a vacuum in which the record is placed, and, third, producing duplicate phonograms from such matrix, substantially as set forth.

This specification signed and witnessed this 17th day of January, 1888.

THOS. A. EDISON.

Witnesses:

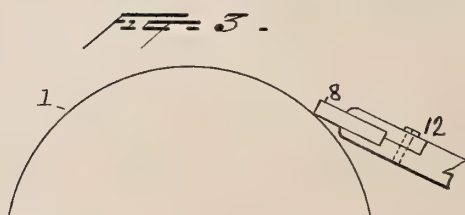
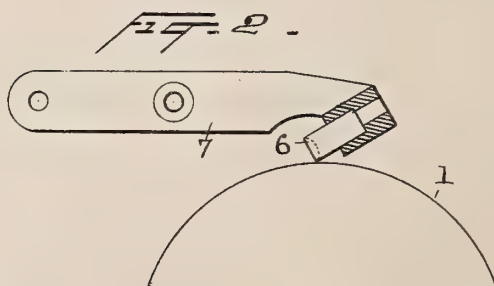
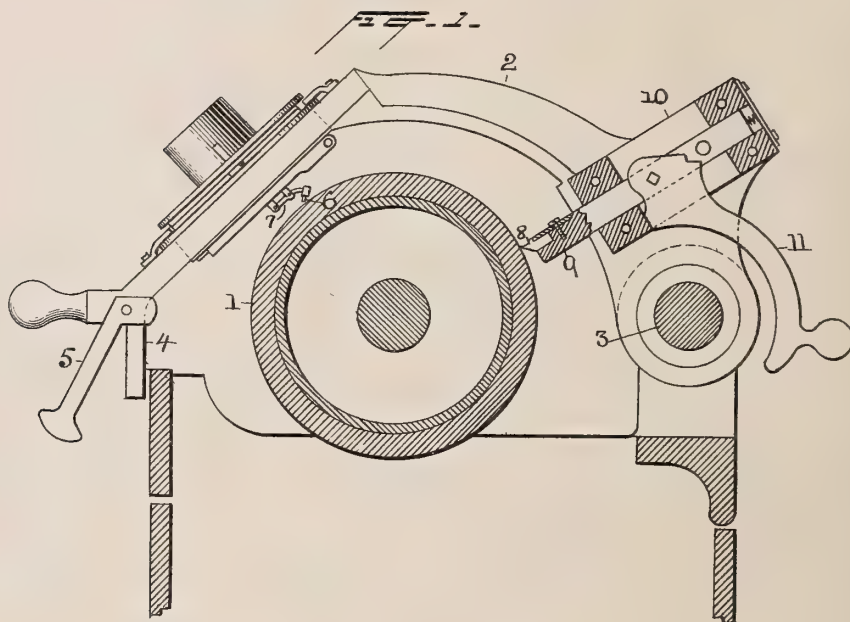
WILLIAM PELZER,
E. C. ROWLAND.

(No Model.)

T. A. EDISON.
PHONOGRAPH CUTTING TOOL.

No. 484,583.

Patented Oct. 18, 1892.



Witnesses
Norris A. Clark.
Charles M. Catlin.

Inventor
T. A. Edison.
By his Attorneys
Lyert Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH CUTTING-TOOL.

SPECIFICATION forming part of Letters Patent No. 484,583, dated October 18, 1892.

Application filed May 27, 1890. Renewed March 30, 1892. Serial No. 427,012. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Phonograph Cutting-Tools, (Case No. 861,) of which the following is a specification.

In practice it is found that after phonographs have been in use for a time the articulation of the speech reproduced is not so smooth and clear as when the phonograph was first put in use. While the articulation is sufficiently good to be intelligible, the false or extraneous vibrations are such as to cause unpleasant and sometimes confusing noises at the reproducer. I attribute this to the fact that by continued use the cutting-edge of the recorder and of the turning-off tool and the bearing point or end of the reproducer become roughened and this causes false marks to be made on the phonogram-blank. The recording-surface of the phonogram-blank is ordinarily of wax or a stearate or hard metallic soap or other wax-like material or composition, and it would naturally be supposed that a tool of steel of the best quality would be entirely satisfactory for use in connection with such a comparatively-soft substance. I have, however, found that such tools are subject to the objection above set forth. This is due to the chemical action of acids or other substances found in the wax-like material or composition of which the phonogram-blank is made and to the dulling and roughening action of fine particles of silica or other hard material which become mixed with the wax-like material during the manufacture of the blank or which become lodged on the surface thereof. After many trials I have found that a sapphire or other similar jewel co-operates in the most effective manner with the wax-like phonogram-blank, since the acids thereof do not attack these substances, they are not rusted by moisture, and they are adapted to withstand the dulling action of the hard particles referred to.

The present invention consists in a cutting-tool (which may be either the recording-point or the turning-off tool) for a phonograph of a jewel or similar substance which will withstand the corroding action of acid and in cer-

tain combinations which will be hereinafter described and claimed.

The reproducer is not claimed herein, since it forms the subject of another application filed on even date herewith.

In the accompanying drawings, which illustrate the invention, Figure 1 is a side view, partly in section, of a phonograph of well-known form with the improved cutting-tools attached. Fig. 2 shows the recorder on a larger scale, and Fig. 3 is a view of a turning-off tool of slightly-different shape from that illustrated in Fig. 1.

1 is the wax-like phonogram-blank, mounted on a cylinder in the ordinary manner.

2 is the arm carrying the recorder and sleeved onto the guide-rod 3 and movable thereon.

4 is the guide-rest, on the upper edge of which the recorder-frame bears and along which it slides.

5 is a cam-lever for raising the frame and thereby removing the recorder from the surface of the blank.

6 is the recorder, preferably of sapphire, as above described. In the form shown the recorder is in the shape of a cylinder, the outer end being hollowed out, thus leaving a curved sharp edge for cutting the surface of the blank. This particular form does not constitute a part of the present invention, since it is claimed in my application, Serial No. 306,670, dated April 10, 1889. This cutting-tool is mounted in a socket or sleeve at one end of the pivoted lever 7, the opposite end of which is connected to the phonograph-diaphragm.

8 is a cutting-tool, which is technically termed the "turning-off" tool, and which is used for removing a previous record and for giving a smooth and even surface to the blank on which to impress a new record. This tool is also made of sapphire or of quartz, agate, or similar hard material not readily affected by the acids. In the construction shown it is clamped to the carrier 9, which is movable in the holder 10, and 11 is a handle for moving the cutting-tool onto or off from the surface of the blank.

I have found that a turning-off tool which does not have a sharp cutting-edge, but has such edge ground away to form a right angle or approximately a right angle, so that the

edge will not enter beneath the surface of the material, can be used to advantage. As such an edge cuts the material, it breaks it above the cutting-edge, so that the chips do not
5 carry with them any portion of the blank below the line of cutting. This form of turning-off tool is illustrated in Fig. 3, where 8 is the sapphire cutting-tool supported in the clamp 12. This tool is supported, as indicated,
10 so as to present its cutting-edge obliquely to the surface of the phonogram-blank.

Having thus described my invention, what I claim is—

1. In a phonograph employing phonogram-
15 blanks of wax-like material, and in combination with a holder for such blanks, a jewel

cutting-tool situated with relation to said holder, so as to operate upon the blank held thereby, substantially as set forth.

2. The combination, in a phonograph, with 20 a phonogram-blank of comparatively-soft material, of a jewel recorder, substantially as described.

3. The combination, in a phonograph, with a phonogram-blank of a wax-like material, of 25 a sapphire recorder, substantially as set forth.

This specification signed and witnessed this 24th day of May, 1890.

THOS. A. EDISON.

Witnesses:

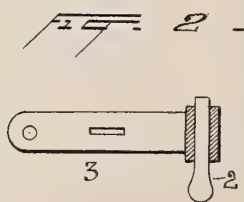
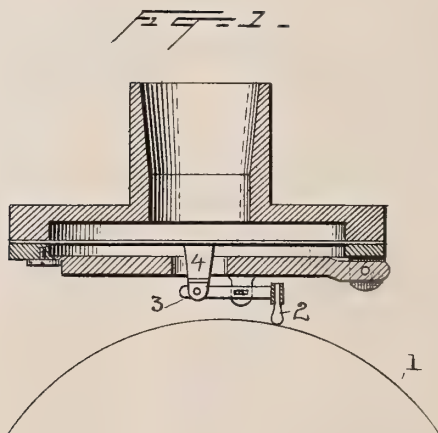
A. O. TATE,
THOMAS MAGUIRE.

(No Model.)

T. A. EDISON.
PHONOGRAPH REPRODUCER.

No. 484,584.

Patented Oct. 18, 1892.



Witnesses
Storrs A. Clark
Charles M. Catlin.

Inventor
T. A. Edison.
By his Attorneys
Lyons & Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 484,584, dated October 18, 1892.

Application filed May 27, 1890. Renewed March 30, 1892. Serial No. 427,013. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Reproducers, (Case No. 862,) of which the following is a specification.

In practice it is found that after phonographs have been used for a time the articulation of the speech reproduced is not so smooth and clear as when the phonograph was first put in use. While the articulation is sufficiently good to be intelligible, the false vibrations are such as to cause unpleasant and some times confusing noises at the reproducer. I attribute this to the fact that by continued use the cutting-edge of the recorder and of the turning-off tool and the bearing point or end of the reproducer become roughened. The recording-surface of the phonogram-blank is ordinarily of wax or a stearate or hard metallic soap or other wax-like material or composition, and it would naturally be supposed that a tool of steel of the best quality would be entirely satisfactory for use in connection with such a comparatively-soft substance. I have, however, found that such tools are subject to the objection above set forth. This is due to the chemical action of acids or other substances found in the wax or composition of which the phonogram-blank is made, and to the dulling and roughening action of fine particles of silica or other hard material which become mixed with the wax during the manufacture of the blank or which become lodged on the surface thereof. After many trials I have found that hard crystals, earthy oxides, and gems—such, for example, as sapphire, quartz, or garnet, all of which may be termed “jewels”—co-operate in the most effective manner with the wax-like phonogram-blank, since the acids thereof do not attack them, they are not rusted by moisture, and they are adapted to withstand the dulling action of the hard particles referred to.

The present invention consists, in a reproducer for phonographs, of a jewel possessing the characteristics above mentioned.

The recorder and turning-off tool are not claimed herein, since they form the subject-matter of an application filed by me on even date herewith.

In the accompanying drawings, which illustrate the invention, Figure 1 is a view of the reproducer bearing on the surface of a phonogram-blank. Fig. 2 is a detached view, on a larger scale, of the reproducer.

1 is the surface of the phonogram-blank.

2 is the jewel reproducing-point, the bearing end of which is preferably spherical or rounded. This jewel is held in any suitable manner at one end of the pivoted lever 3, the opposite end of which is connected to the phonograph-diaphragm by means of the post 4.

Reproducing-points made as above described not only are more durable than those of metal, but they move more readily over the record and do not introduce false vibrations into sounds reproduced.

Having thus described my invention, what I claim is—

1. The combination, in a phonograph, with a phonograph-blank of wax-like material, of a jewel reproducer, substantially as described.

2. The combination, in a phonograph, with the phonogram-blank, of a rounded jewel reproducer, substantially as described.

3. A reproducer or bearing-point for phonographs, consisting of a jewel not affected by chemicals or chemical action of the wax-like material of the phonogram-blank, substantially as described.

This specification signed and witnessed this 24th day of May, 1890.

THOS. A. EDISON.

Witnesses:

A. O. TATE,
THOMAS MAGUIRE.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 484,585.

Patented Oct. 18, 1892.

Fig. 1.

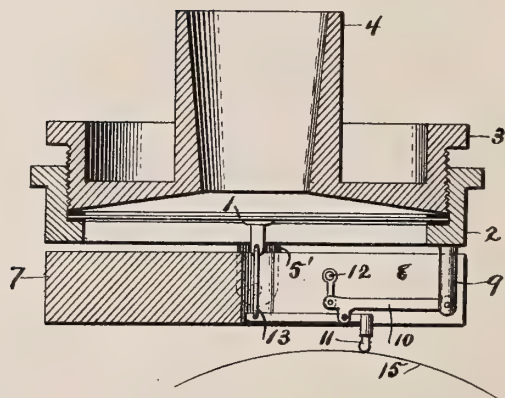
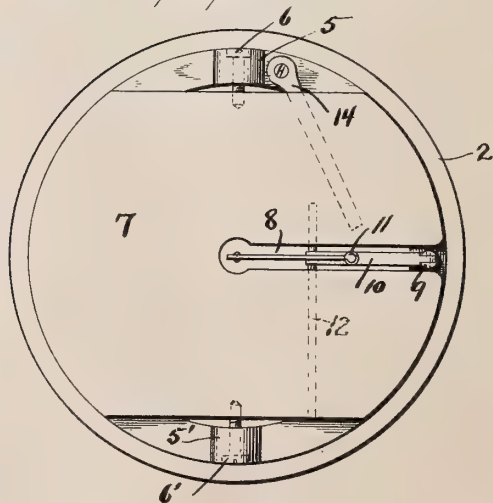


Fig. 2.



Witnesses
Norris A. Clark,
W. E. Egan

Inventor
T. A. Edison,
By his Attorney,
Sylvester Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 484,585, dated October 18, 1892.

Application filed July 30, 1890. Renewed March 30, 1892. Serial No. 427,014. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 865,) of which the following is a specification.

The present invention relates to a weight or retarding device on which the operating-point (recorder or reproducer) of a phonograph is carried, and to which it is connected by a pivotal or jointed connection in a well-known or any suitable manner.

The invention consists mainly in a support for the operating-point in the form of a balanced block or plate, and in certain features of construction and combinations in connection therewith, as hereinafter described and claimed.

The device is an improvement on the form heretofore employed, in which the weight supporting the operating-point was pivoted at one edge and was therefore not balanced. I have found that by having the weight balanced, and more especially by having it slightly overbalanced on the side at which the point is attached, increased efficiency of operation is attained.

In the accompanying drawings, which illustrate the invention, Figure 1 is a cross-section of a phonograph-reproducer embodying the improvement, and Fig. 2 is an inverted plan of the same.

The phonograph-diaphragm 1 is supported between the ring 2 and the adjustable ring 3 with elastic or yielding washers or cushions around its edge in the usual manner.

4 is a tubular extension, to which a hearing-tube may be connected. From the ring 2 extend two posts 5 5' at diametrically-opposite points. These posts are perforated for the reception of pivot-screws 6 6', between which is hung the counterbalanced weight or retarding device 7, which is a plate or block of metal or other suitable material. In the plate or block 7 is a slot 8, extending from one edge of the block to the center. From ring 2 a post 9 extends into or in line with the slot, and to this post is pivoted a lever 10, to which the operating-point of the phonograph (here shown as a reproducing-point) is

pivotally connected. A link connects lever 10 to the pin 12 and a link 13 connects the diaphragm to the operating-point.

As before indicated, it is preferable to give the retarding device a slight bias toward the phonogram-blank 15 on that side of the axis which carries the operating-point. In the instrument illustrated a spring 14 is supported on the lower edge of ring 2 and presses downwardly on plate 7 for the purpose of thus counterbalancing or overbalancing said plate. This may, however, be done in other ways, as by pivoting the plate at one side of its center of gravity or by adding a weight on one side of the pivot.

The operation of the apparatus above described is as follows: When the phonogram-blank is turned in the ordinary manner, the operating-point follows the phonogram-record and transmits the same to the diaphragm without appreciably moving weight 7, owing to the fact that it has sufficient mass to give it considerable inertia; but should there be any large irregularity in the surface of the phonogram-blank the weight will be tilted by means of the operating-point, pivot 12, and intermediate parts, thus avoiding false and disturbing movements of the diaphragm.

The advantage of pivoting the retarding device adjacent to its center of gravity instead of pivoting it at one edge, as heretofore, is that the weight of the plate or a greater part thereof is removed from the operating-point, while at the same time the inertia of the weight holds the supporting-pivot of the operating-point stationary during normal operation of the instrument and allows said pivoted and connected parts to move when necessary, as above described.

It will be evident that with this arrangement of the several elements described the instrument may be used readily in other positions than a horizontal with equally-good results.

The shape and location of the spring and several of the other elements may be varied to some extent without departing from the invention.

Having thus fully described the invention, what I claim is—

1. In a phonograph, the combination, with a diaphragm suitably supported, of an oper-

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ating-point connected therewith and supported on a weight pivoted adjacent to its center of gravity, substantially as described.

2. In a phonograph, the combination, with
5 a diaphragm suitably supported, of an operating-point connected therewith and supported on a plate or block pivoted adjacent to its center of gravity and means for overbalancing the plate, substantially as described.

10 3. The combination, in a phonograph, of a diaphragm, a reproducer connected therewith, and a counterbalanced plate or block on which said reproducer is supported, substantially as described.

15 4. In a phonograph, the combination, with a diaphragm, of an operating-point connected therewith, the weight pivoted adjacent to its center of gravity and slotted at one side of

the center, a pin carried by the weight, and a link connection between the pin and operating-point, substantially as described. 20

5. In a phonograph, the combination, with a diaphragm, of an operating-point connected therewith, the weight pivoted adjacent to its center of gravity and slotted at one side of 25 the center, a compensating spring, a pin carried by the weight, and a link connection between the pin and operating-point, substantially as described.

This specification signed and witnessed this 30 5th day of July, 1890.

THOMAS A. EDISON.

Witnesses:

E. COURAN,
W. PELZER.

(No Model.)

W. BRUENING.

APPARATUS FOR RECORDING SPEECH OR OTHER SOUNDS.

No. 486,394.

Patented Nov. 15, 1892.

Fig. 1

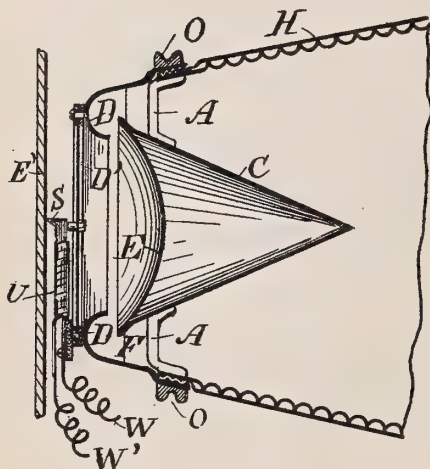


Fig. 3.

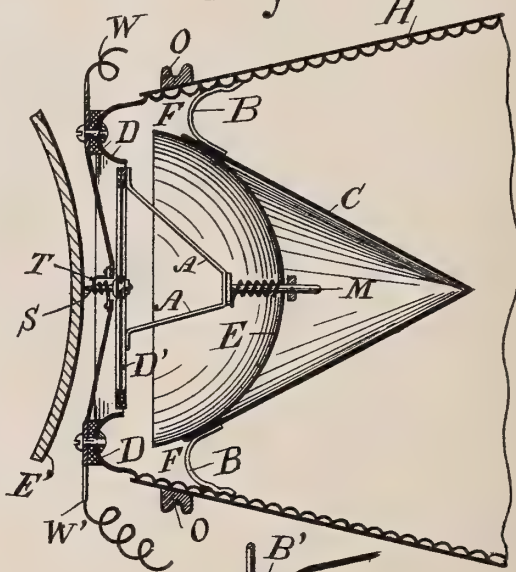


Fig. 2.

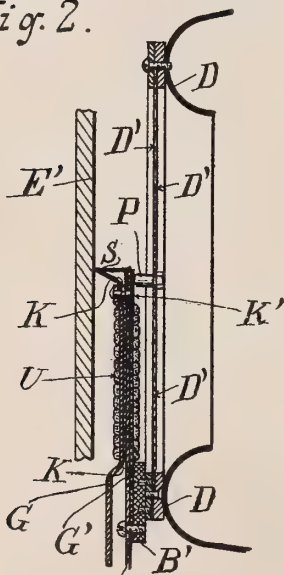
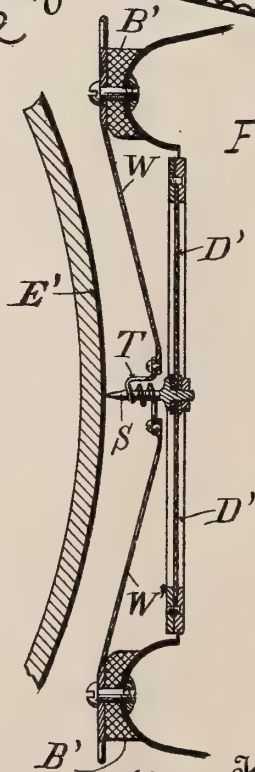


Fig. 4



Witnesses
Chas. Hanemann
Edward S. Berrall.

Inventor
William Bruening.

UNITED STATES PATENT OFFICE.

WILLIAM BRUENING, OF EAST ORANGE, NEW JERSEY.

APPARATUS FOR RECORDING SPEECH OR OTHER SOUNDS.

SPECIFICATION forming part of Letters Patent No. 486,394, dated November 15, 1892.

Application filed July 23, 1891. Serial No. 400,451. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRUENING, a citizen of the United States, residing in the township of East Orange, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Apparatus for Recording Speech or other Sounds, of which the following is a specification.

My invention relates to the apparatus for directing the sound-waves upon the diaphragm or other vibrating mechanism in a phonograph, to the improved apparatus for recording sound-waves, and to the means of heating a recording-style used for the purpose.

The objects of my invention are to obtain a more perfect action of the diaphragm and style in making a record of sound-waves in or on solid resisting material and of providing an efficient method of imparting heat to the style for the aforesaid purpose.

I attain the objects of my invention by the means set forth and described in this specification and illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a vertical sectional view of a part of the horn or sound-conveyer, of the diaphragm, sound-wave reflecting devices, style, and section of a phonographic record or tablet. Fig. 2 is an enlarged sectional view showing the construction of style in connection with the diaphragm and tablet and the method of establishing the same in an electrical circuit. Fig. 3 is a modification of Fig. 1, showing variations in the method of supporting the diaphragm and heating the style by electricity when not in circuit; and Fig. 4 is an enlarged view of the last-mentioned part of the same.

Similar letters represent similar parts throughout the figures.

H is the horn or part of the horn or sound-conveyer, which is provided at its smaller end with the inwardly-projecting annular concave reflector D.

C is a deflector, preferably of cone shape, and is held within the horn H by the brackets B, leaving the annular space F between its large end and the inside of the horn, through which sound-waves are deflected upon the annular concave reflector or reflecting-surface D. The large and forward end or

base of the cone-shaped deflector C has the shape of a concave reflector E, which may be spherical or parabolical, and has in front of it the diaphragm D', the center of which is located at the focus of the spherical reflecting-surface E, supported either upon the back or convex side of the deflecting-surface, as shown in Fig. 1, or by arms A and stem M, as shown in Fig. 3.

The style S, Figs. 1 and 2, which may be of any suitable shape and construction and is made of electrical resisting material, is located in an electrical circuit of which W W' are the wires.

G G' are springs, preferably made flat and of good conducting material, bearing upon the post P of the diaphragm and located in the circuit, and they are electrically connected at one end by the style S. Strips of mica K K' properly insulate the two springs, the ends of the style, and all these parts from the post of the diaphragm.

U is a rubber band or strip. (Shown in section in Fig. 2.)

The post P, supporting the style and circuit, may be made of non-conducting material, which is wound around the springs and inclosed mica strips for insulating purposes and for the purpose of securing the parts together.

B' is a hard-rubber block which gives insulated support to the springs and style.

O O are shoulders for securing the horn in its frame or holder by means of set-screws or a clamp or other suitable device.

The operation of the apparatus is as follows: Sound-waves developed within the horn H are deflected through the annular passage F upon the reflecting-surface D, thence upon the concave reflecting-surface E behind the diaphragm D', and therefrom upon the center of the adjacent side of the diaphragm D'. The force exerted by the sound-waves is thereby applied to the least resisting part of the diaphragm and a better effect obtained than when it is directed upon the whole surface thereof.

When the apparatus is about to be operated for the purpose of making the record, the circuit of the wires W W' is closed and the style S becomes heated by the friction of the electrical current, and by the action of the style and the aid of the heat imparted thereby re-

cords the sound-waves in the material of the tablet E', which is composed of some fusible material or material which may be softened by heat and which is firm at ordinary temperatures. It is unnecessary to describe the style in detail, except to say that it must be of such construction and dimensions and such material that a suitable electrical current will heat the style to a sufficient extent to make the record in or on the aforesaid recording material and in such manner, according to the recording method employed.

Figs. 3 and 4 show modifications in the method of supporting the diaphragm and also in the method and apparatus for heating the style, which consists of a coil, preferably of platina wire T, surrounding the style S. The style is properly insulated from the diaphragm if the latter is an electrical conductor, and, as shown in Fig. 4, by washers of non-conducting material between the diaphragm and the shank and shoulders of the style, and the platina wire being located in an electrical circuit and heated by an electrical current heat is communicated to the style either by conduction or radiation for the purpose of making the record in the recording material or tablet. I preferably support the style S, and to some extent the diaphragm D', in one—say the most forward—of the coils of the platina wire T, and through the contact given by such support the heat generated in the platina wire may be transferred to the style by conduction, and heat may also be transferred to the style from the other parts of the coiled platina wire which do not make contact therewith by radiation; but I do not confine myself to either radiation or conduction exclusively, since the amount of heat required depends largely upon the fusibility of the material composing the tablet and in which the record is to be made.

The horn or sound-conveyer and reflector, as well as the style herein shown, may be used in connection with my apparatus shown in my application already allowed in phonographs, Serial No. 377,724, filed January 14, 1891.

I claim as my invention—

1. In a phonograph, a horn or sound-conveyer, one end of which projects inwardly and forms a concave annular reflector, in combination with a spherical reflector, a diaphragm which presents its inner side to the concave surface of the spherical reflector and is supported by its frame on the convex surface of the annular reflector, and a recording-style which is supported on the outer side of said diaphragm.

2. In a phonograph, a style consisting of a loop of an electrical circuit, the two limbs of which are insulated from each other and from the diaphragm, and the end of which loop is provided with a suitable point for making the record in a phonograph record-blank.

3. In phonographs, a style S, consisting of a loop of an electrical circuit-wire, the point of which is formed by an acute angle in the bend of the loop, the two sides of the loop insulated from each other by the insulating material K and the whole being insulated from the diaphragm.

4. In phonographs, the style S, springs G G', and insulating material K K', in combination.

5. In phonographs, the style S, springs G G', insulating material K K', and rubber block B', in combination.

6. In phonographs, the style S, springs G G', insulating material K K', rubber block B', and rubber band U, in combination.

WILLIAM BRUENING.

Witnesses:

JAMES A. SKILTON,
EDWARD S. BERRALL.

(No Model.)

W. BRUENING.

APPARATUS FOR RECORDING SPEECH OR OTHER SOUNDS.

No. 486,608.

Patented Nov. 22, 1892.

Fig. 1.

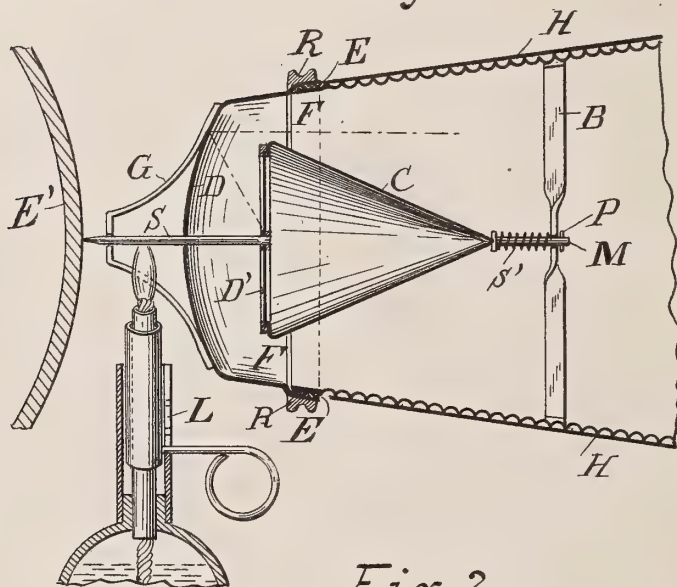
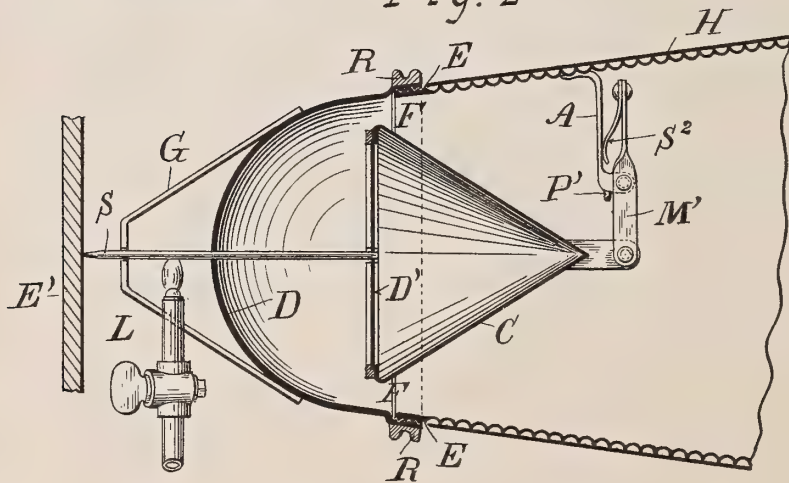


Fig. 2.



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APPARATUS FOR RECORDING SPEECH OR OTHER SOUNDS.

SPECIFICATION forming part of Letters Patent No. 486,608, dated November 22, 1892.

Application filed July 23, 1891. Serial No. 400,450. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRUENING, a citizen of the United States, residing in the township of East Orange, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in the Art of and in the Product of the Apparatus for Recording Speech or other Sounds, of which the following is a specification.

My invention relates to the apparatus for directing the sound-waves upon the diaphragm or other vibrating mechanism in a phonograph and the record produced thereby; to a damping device or method for damping the diaphragm; to the method of suspending the diaphragm in relation to the recording-body; to means for supporting the style in relation to the recording-body by, in, or through a sound-wave reflector; to the devices, means, method, and art whereby the record is made and whereby it is or becomes more permanent and durable when used to reproduce the sounds by reason of its increased hardness subsequent to the making of the record; to the record so made, and also to the combinations of these devices, means, methods, and arts.

My invention has for its objects to provide a durable sound-record from which sounds may be effectively reproduced and an efficient method and apparatus for recording sound; and it consists in improvements which will further sufficiently appear in connection with the further description of the apparatus and method or art and method of operation to follow, and in the claims annexed hereto.

I attain the objects of my invention by the means, mechanism, method, and art set forth and described in this specification and illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a vertical sectional view of a part of the horn or sound-conveyer; of the diaphragm and style; of the sound-wave-reflecting surface; of the damping device, and of the means for supporting the diaphragm and style in relation to the recording-surface, together with a part sectional view of a lamp for heating the style. Fig. 2 is a vertical sectional view showing a different alternative method of supporting the diaphragm,

style, and damping device at one end, together with a gas-jet.

Similar letters represent similar parts throughout the figures.

H is the horn or part of the horn or sound-conveyer, which is preferably made of thin sheet metal or other hard substance, and has a continuous spiral thread or raised consecutive rings or corrugations, with the convex side placed inward, to be covered on its outer surface with felt, rubber, paper, or other suitable soft material to check or prevent waste of energy through vibration of the horn itself when in use. The object of the spiral thread, rings, or corrugations is to deflect the sound-waves developed within the horn.

D is a concave or dome-shaped sound-wave reflector, secured to the horn by screw-threads, as shown at E, or in any usual manner. A grooved annular ring or projection R on the outer side of the horn H or the reflector D serves the purpose of or is the means for holding the device in a proper relative position to the recording-body, whereby it may be sustained, as in a clamp, frame, or other suitable device.

D' is the vibrating diaphragm, and S is the style or recording-instrument secured to the center of the same, and may be of any required shape to make a groove of any required form in cross-section. As shown in Figs. 1 and 2, the diaphragm D' is secured to the front end of a cone C, which last is made of sheet metal, and is suspended at one end either by a stem M, supported in a cross-bar B, (see Fig. 1,) or by a spring-lever M', secured to an arm A, projecting from one side of the horn. (See Fig. 2.) I surround the stem M in the one case with a spiral spring S', which rests against the cross-bar B at one end and at the other end against a collar located at the apex of the cone, the object of which is to press the style S toward and into the recording body and material gently, but with sufficient force to keep it in proper relation thereto. This proper relation consists in keeping the point or end of the style constantly in the recording body and material—that is, below its surface. Fig. 1 shows the stem M with a button or collar P attached, and Fig. 2 a stop P' on the arm A, against which the lever M' abuts. The style S passes through the center of the

reflecting-dome and also through the guide G, which holds it in position primarily in relation to the recording body or material, and, secondarily, so as to check foreign vibrations.

5 E' is a section of a recording-body, which may be curved or plane.

L is the lamp or gas burner, the flame of which is brought in such relation to the style S as to heat the same when in use, and provision is made for regulating the dimensions of the flame and the amount of heat to be conveyed to the style by raising or lowering the cannula surrounding the wick-tube. I prefer to support the style S by means of a guide between the flame and the recording body or material for obvious mechanical reasons; but if the guide G be omitted the style S may be supported and guided in and by the reflector D, through the center of which it passes, and in that case it will be advisable to shorten the style in that part which projects beyond the reflecting-dome. When sound-waves are developed within the horn H, it is intended that they shall be guided between the inside surface of the horn and the opposite conical surface C, all around, toward, and through the annular space F around the base of the cone against the inside of the dome D, to be reflected therefrom upon the diaphragm and approximately focused to the greatest possible extent upon and around its center, to which the style is secured. In this way I concentrate or condense the sound-waves or their force and action on the diaphragm near to and around the style, and thereby secure a stronger, quicker, and better vibratory action of the diaphragm and control of the style. Where the sound-waves are distributed and take effect equally on all parts of the diaphragm, as heretofore described and directed, the active effects upon the style and upon the recording surface or body must be less than where the same amount of force is expended around the style near the center of the diaphragm. Behind the diaphragm D' is a conical air-chamber, the air of which is in contact with the rear side of the diaphragm D' and acts as a damper or as an elastic medium bearing upon the inside of the diaphragm in such a way as to damp it, prevent false or foreign vibration, project its active center into its normal forward position, and thereby cause it to produce a more perfect record.

I do not desire to confine my invention to the cone-shaped deflector and air-chamber, and recognize that those of other forms will to some extent perform the same functions.

I show two ways of producing a spring-pressure upon the cone C, carrying the diaphragm D' and style S, for the purpose of maintaining the relations of the style to or in a recording-body. In one case I use the style-spring S', and in the other case (shown in Fig. 2) the alternative method in which the spring S², reacting upon the lever which supports the end of the cone, produces a similar effect thereon.

The apparatus, as far as described, may be used in connection with any of the previously-known methods or mechanisms for recording sounds, but I prefer to use a new method and recording material adapted thereto.

Heretofore sound-records, from which sound is directly reproduced, have been made by a style vibrated by sound-vibrations, indenting or impressing on the surface of yielding material which is supported on a grooved cylinder or wheel or on other material. By the pressure exerted on the surface of such material the material under the style recedes and causes the motion of the surrounding material. This has been found in practice to produce a defective record by changing the form of a recorded sound wave or waves by the action of the style and the movement of the material in recording a succeeding wave. This defect has been obviated by cutting or engraving a groove containing a sound-record in solid resisting material with a vibrating cutting-style, whereby the material is removed in small pieces, chips, or shavings, which, however, offer great resistance to the action of the style and diaphragm and give rise to annoyance by a part of such removed material clinging to the record and causing imperfect reproduction. A more perfect record is obtained by causing resisting material which is in the path of a style to become non-resisting and by the driving action of the style urge it to flow, move, or drift from such path, while the material which is not in the path of the style remains firm or in place. The displaced material is disposed on the edges of the path in a mass and becomes firm, and for this purpose I use in the tablet or blank recording material which is firm at ordinary temperatures and which may be fused by heat, and I fuse the material and form the record by means of a style acting and heated as herein further described. For these purposes I use different kinds of wax, gum, soap, or asphaltum alone or in the form of compounds, and also varnishes, hard rubber, celluloid, gutta-percha, and any easily-fusible metals or their alloys or amalgams, or any other substances or materials upon which heat has similar effects. The recording tablet or blank may be made wholly of or merely covered by the materials mentioned. Since these substances differ in their capacity to resist the action of heat in the respects mentioned, the temperature of the style is to be varied or graded to meet the corresponding characteristics and resistances of the particular one of the materials mentioned that may be in use, and in each case the temperature must be co-ordinated with or accommodated to the speed of the mechanism and the rapidity with which the record is made or to be made. Of course with the same temperature of the style the recording body or tablet may be moved more rapidly where the more easily-yielding materials are used than where hard rubber or most of the fusible metals are used.

Different kinds of wax even will require different temperatures; but the temperature must be sufficient and the speed sufficiently slow to produce the desired effect upon the recording material or tablet by removing the material from the path of the style and disposing it on each side thereof, but without in any way removing the material from the tablet.

In operation, when the tablet provided with solid fusible material is placed in the phonogram-holder of my phonograph shown in the application Serial No. 377,724, filed January 14, 1891, or of any other such mechanism, and the recording apparatus is placed in position on the diaphragm-holder of such instrument, and the flame or other source of heat is applied to the style, the intensity of which may be regulated, as shown in Figs. 1 and 2, the style is thereby heated to a sufficiently-high temperature to fuse or melt the recording material and is brought into contact with the substance of the tablet and fuses the material thereof by such contact, which allows the style to be sunk therein to a desired depth by displacing the mass of fused or melted material, while the material beyond the contour of the style remains firm or in place. Having determined the depth of the intended groove and secured the heated style in proper position, the style is vibrated by imparting sonorous vibrations thereto and is progressed in relation to the tablet, either by the movement of the tablet or of the style, or of both, and it fuses or melts the material in its path, which is in the substance of the tablet through and beneath its surface, and causes the movement or drift of such fused or melted material by detaching it from the firm material forming the margin of the path and driving it forward and outward upon the edges of material which remains in place there to form ridges which increase the depth of the groove. The record is formed, mainly, by the anterior half of the surface of the style, which, so far as it makes contact, bears against the recording material directly in front of it and detaches it by fusion and drives it out of its path, whereby the greater part of the resistance of the material is borne by the progressive movement of the style, while but a minimum of resistance is offered to its vibratory movement. When the contact with the heated style has ceased, the material congeals and a groove is thereby formed, the irregularities of which correspond in form to sound-vibrations, and the surface of its walls and of the ridges presents a glazed or semi-fused appearance. The action of the plowshare and its mold-board in displacing and turning up the soil and molding it into ridges on the edges of the furrow is an action analogous to that of the heated style in this invention, except that here the fused or melted material flows, moves, or drifts in a coherent or viscous mass. The advantages of this method of making a sound-record, which consists in applying heat

to that part of the recording material which is in the path of a style of a temperature corresponding to that of its melting-point by means of the style which is heated for that purpose and to that extent and thereby fusing and driving such material from that path, lie in the greatly-decreased resistance which such fused or melted material offers to the action of the diaphragm and style and with the same force necessary to cut a sound-record in a solid body or to indent or impress such record on the surface of foil or of merely softened wax sound-waves of greater amplitude are recorded, and that as in this invention only such material is fused and moved which is directly in the path of the style every motion of the style is reproduced in the recording material without marring or deforming any part of the previously-made record, while in a record made by indenting or impressing on a yielding or softened surface the material directly under the style is pressed against the adjacent material and causing movement thereof the shape of the surface previously traversed by the style is changed and the record caused to be defective, and as the contour of the heated style in this invention determines the shape of the walls and surface of the record they are smooth and polished, while in cutting a record in more or less brittle material they are chipped and rough, and here no particles of recording material adhere to and clog the heated style as they are fused or melted and flow therefrom. The displaced or detached material is herein utilized to serve a useful purpose in increasing the depth of the groove, and thereby guiding the reproducing-style more securely, where in other records it causes disturbance. As sounds are more accurately recorded by this method, a more effective reproduction of sound results from such a record, which may be made in material particularly adapted to make it durable. In speaking herein of the path of the style such part of the recording material is meant thereby which is traversed by the style in its vibratory movements, as well as in its progressive movement relative to the tablet.

While I prefer to make the style with a rounded point, I do not limit this invention to any particular form or length of style; but the style may be of any usual construction capable of being heated. I find it to be the simplest and cheapest way to heat the style by the use of the flame of some kind of lamp bearing directly upon the style, as shown in Fig. 1; but the style may be heated by electricity in several ways, two of which are shown in a companion application filed herewith at the same date, and with substantially the same effect or general results. While I contemplate the use of these devices in making the record by cutting, engraving, or indenting without heating the style, I prefer to use them in connection with the kind of record and method of action described, for the

reason that the effects of the heated style diminish to a minimum the demand made upon the diaphragm to make the record—that is to say, I can use the apparatus to advantage in making the record without heating the style.

The recording body, tablet, or material, the horn, diaphragm, air-chamber, reflectors, and deflectors, and the heated style herein described may all or any of them be used in connection with my phonographic apparatus and invention described in my application in phonographs already allowed and passed to issue, Serial No. 377,724, filed January 14, 1891.

I claim as my invention—

1. In a phonograph, a style supported at two or more points, in combination with an applied flame or other source of heat.

2. In a phonograph, a style supported at two or more points, in combination with a flame or other source of heat applied between the support that is adjacent to the record-surface and the diaphragm-support.

3. A phonographic diaphragm provided on the side presented to the mouth of the horn with a shield having a cone, convex or dome shape, which prevents contact of sound-waves with that side.

4. In combination, a phonographic diaphragm and a cone-shaped shield covering and protecting the diaphragm on the side presented to the mouth of the horn from the contact of the sound-waves, and the outside of which has a sound-wave-deflecting surface, arranged to deflect the same through an annular space around the diaphragm and into a chamber in front of the same.

5. A phonographic diaphragm provided on the side presented to the mouth of the horn with a cone-shaped shield against the contact of sound-waves, which on its outside deflects sound-waves into and through an annular space around the diaphragm upon a dome-shaped reflector.

6. A phonographic diaphragm provided on the side presented to the mouth of the horn with a cone-shaped shield against the contact of sound-waves, which on its outer side deflects sound-waves into and through an annular space around the diaphragm upon a dome-shaped reflector and thence upon the diaphragm.

7. In combination with a diaphragm of a

phonograph, the concave or dome-shaped deflector placed between the diaphragm and the recording-surface so as to deflect sound-waves upon the front or adjacent face of the diaphragm.

8. A horn or cone shaped sound-conveyer closed at the small end by a concave or dome-shaped cap, in combination with a diaphragm provided with a style which passes through the cap toward the recording body or material, upon which diaphragm sound-waves are reflected from the concave surface.

9. A horn or cone shaped sound-conveyer terminated at the small end by a dome or concave cap, an inner cone-shaped shield covering and protecting one side of a phonographic diaphragm from the action of sound-waves, and the diaphragm provided with the style projecting through the cap toward the recording body or material, all in combination.

10. The diaphragm of a phonograph provided on the side presented to the mouth of the horn or sound-conveyer with a shield, which prevents the contact of sound-waves therewith, substantially as shown and described.

11. A diaphragm of a phonograph provided on the side presented to the mouth of the horn or sound-conveyer with a closed air-chamber, the front side of which consists of the diaphragm, substantially as shown and described.

12. A horn or cone shaped sound-conveyer provided at its small end with a concave or dome-shaped deflecting-cap, a phonographic diaphragm provided with an air-chamber on the side adjacent to the mouth of the horn or sound-conveyer, and with a style projecting through the deflecting-cap of the horn toward or into the recording body or material, all in combination.

13. A phonographic diaphragm provided with a frame and style, in combination with a horn or sound-conveyer, means for movably supporting said diaphragm and style in said horn, and a spring bearing on the frame of the diaphragm to press the style toward the tablet.

WILLIAM BRUENING.

Witnesses:

JAMES A. SKILTON,
EDWARD S. BERRALL.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 488,189.

Patented Dec. 20, 1892.

Fig. 1.

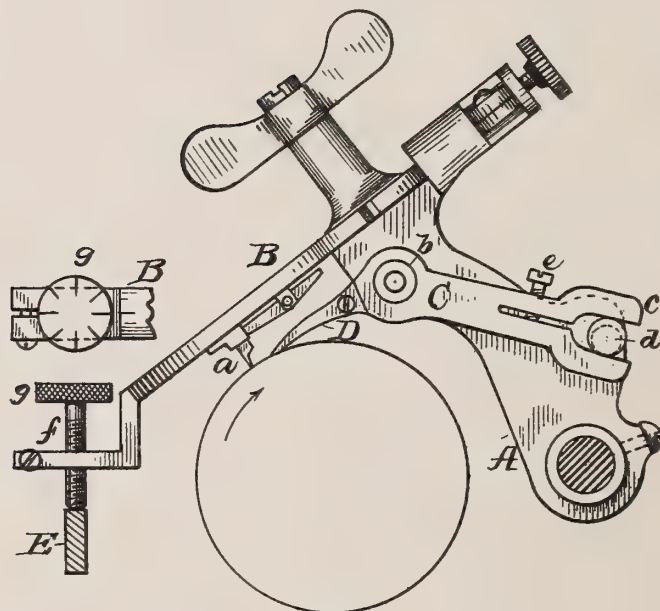


Fig. 3.

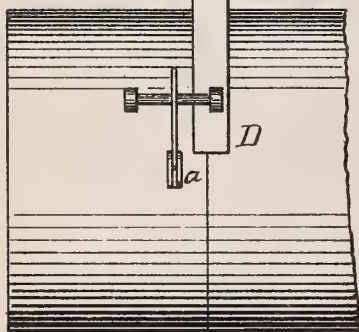
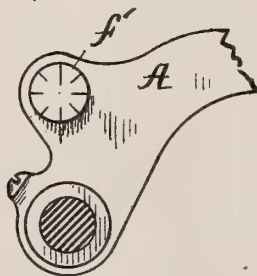


Fig. 2.



Witnesses
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Inventor
Thomas A. Edison
By his Attorneys

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO
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PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 488,189, dated December 20, 1892.

Application filed May 29, 1888. Serial No. 275,441. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 776,) of which the following is a specification.

My phonograph is provided with a cutting tool for turning off the surface of the wax phonogram blank so that the blank may be used over again after it has once been filled with a record. This tool I have heretofore mounted on the rocking holding arm, which carries the recorder and reproducer, but near the pivot of such arm, so that the tool acted upon the opposite side of the phonogram blank from the recorder and reproducer. This made it necessary for me to adjust the recorder out of action while the cutting tool was in use for turning off the surface of the phonogram blank; hence it became necessary to wait while this was being done before the phonograph could be used for recording. I have found, however, that by mounting the cutting tool so as to act upon the surface of the phonogram blank near to the point of the recorder the old record can be turned off and a new record made at the same time; the recording point being adjusted slightly deeper than the tool so as to record the whole amplitude of the loudest vibrations. When the recording point and cutting tool are placed at a distance from each other as heretofore, their radial distances from the center on which they turn being widely different, when they are adjusted simultaneously they do not move to the same extent, and consequently the depth to which they enter the surface is widely different; but I now place the points in such proximity that they have substantially the same radial distance from the center or pivot of the rocking holding arm, and this enables them to be moved to the same extent and therefore to be adjusted simultaneously and permitted to operate simultaneously upon the phonogram blank.

My present invention relates to providing the phonograph with a cutting tool which will be adapted for action simultaneously with the use of the recorder.

In the accompanying drawings forming

part hereof,—Figure 1 is a side view of the holding arm and attached parts showing the cutting tool and recorder in simultaneous action;—Fig. 2 is a view, from the opposite side, of the holding arm, showing graduated head for adjusting the depth of the cutting tool; and Fig. 3, a plan view of the phonogram blank showing the relative positions of the cutting tool and the recording point.

A, is the rocking holding arm carrying on its upper end the swinging frame B, on which is placed the recorder, whose cutting or recording point is shown at *a*. To the side of the rocking holding arm A near to its upper end is pivoted a lever C at the point *b*, which lever carries a cutting knife D projecting forward close to the recording point *a*. This cutting knife is removably attached to the lever so that it can be replaced when required by a new knife. The lever C projects in rear of its pivot and has a spring fork *c* at its rear end drawn together upon a cam *d* by a screw *e*. This cam *d* is mounted on a turning stem; the head *f'* of which is provided with scale marks or graduations as shown, so that the extent to which the cam is turned may be accurately determined. The frame B is provided with a set screw *f* which bears upon the guide rest E. The head *g* of the screw *f* is provided with scale marks or graduations as shown so that the point of adjustment of the screw can be accurately determined. The bearing of the screw *f* on the guide rest E determines the limit of forward movement of the rocking holding arm, and the frame B attached to it, and by adjusting the screw *f* the recording point *a*, as well as the cutting knife D, are moved toward or away from the surface of the phonogram blank and substantially to the same extent by reason of their close proximity.

In using the instrument, after a blank has once been filled with a record, the cam *d* will be adjusted so as to bring the point of the knife D into the proper relation to the recording point *a*; the screw *f* will then be adjusted so as to let the recording point *a* and the knife D the proper distance into the wax surface of the phonogram blank. The knife D is of course considerably wider than the recording point *a*, so that a smooth track will

be cut by the knife D in advance of the recording point, the knife being set in advance of the recording point in the direction of the longitudinal movement of said point, as is illustrated in Fig. 3. The machine being started, the knife D will turn off the record already on the blank, while the recording point *a* will record the sounds which are produced in the speaking tube connected with the recorder, and thus a new record can be made without the delay of first turning the old record off.

What I claim as my invention is:

1. In a phonograph, the combination of a recorder and a cutting tool mounted upon the phonograph, with their points in close proximity and having common adjusting means for adjusting their position together and practically to the same extent with relation to the surface of the phonogram blank, substantially as set forth.

2. In a phonograph, the combination of a recorder and a cutting tool having their points in close proximity and having a common means for adjusting them together and practically to the same extent with relation to the surface of the phonogram blank, and adjusting means for varying the relative position of the recording point and the cutting tool, substantially as set forth.

3. In a phonograph, the combination with the rocking holding arm, of a recorder mounted thereon and a cutting tool carried by such rocking holding arm and having its point in such close proximity to the recording point, as to be at substantially the same radial distance from the pivot of said arm, substantially as set forth.

4. In a phonograph, the combination with the rocking holding arm, of a recorder and cutting tool carried thereby and having their points in such close proximity, as to have substantially the same radial distance from the pivot of said arm the guide rest and the adjusting screw riding on such guide rest, substantially as set forth.

5. In a phonograph, the combination with the rocking holding arm, of a lever pivoted thereon carrying a cutting tool at its forward end and having a forked shank embracing a cam, by the turning of which the position of the cutting tool is adjusted, substantially as set forth.

This specification signed and witnessed this 26th day of May, 1888.

THOS. A. EDISON.

Witnesses:

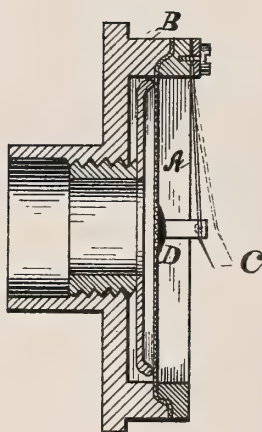
WILLIAM PELZER,
A. W. KIDDLE.

(No Model.)

T. A. EDISON.
PHONOGRAPH REPRODUCER.

No. 488,190.

Patented Dec. 20, 1892.



Witnesses
E. S. Rowland
William Byrd

Inventor
Thomas A. Edison
By *L. S. Attorneys* *John S. Tracy*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO
THE EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 488,190, dated December 20, 1892.

Application filed June 7, 1888. Serial No. 276,383. (No model.)

To all whom it may concern.

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Improvement in Phonograph-Reproducers, (Case No. 774,) of which the following is a specification.

The object I have in view is to improve the reproducer of my phonograph so that it will
10 be more durable, will better maintain its adjustment under varying conditions of heat and moisture and will more effectively reproduce the sound vibrations. I accomplish these ends by an improved construction of the
15 reproducing diaphragm and of the means for connecting the reproducing point therewith. The improved diaphragm I make of thin fabric such as silk preferably of bolting cloth. This is stretched in a frame and is then shellaced or varnished after which it is dried and
20 is ready to be cut to the proper size for the reproducer diaphragm, or the fabric may be stretched in the frame of the reproducer and then shellaced or varnished. The result is a
25 diaphragm which while exceedingly thin and flexible and well adapted to reproduce the sound vibrations, is not liable to stretch, is impervious to moisture and is exceedingly hard and resonant. The diaphragm, therefore, does not become warped by changes in
30 the temperature and moisture of the atmosphere, and the reproducing point maintains the proper position relative to the phonogram blank.

For the reproducing point I use a wire of phosphor or aluminium bronze. It is secured to the frame at one side projects toward the center of the diaphragm and substantially
35 parallel therewith, and is turned down to form the point. Instead of connecting this point with the diaphragm by an elastic strip or band of rubber I have found that a solid block of gum rubber is better for the purpose, since there is less loss in loudness of articulation
40 due to the elasticity of the medium between the point and the diaphragm. The wire is sprung away from the diaphragm so that when the block of rubber is cemented both to the diaphragm and the spring wire the dia-
45 phragm will be under a slight tension.

In the accompanying drawing forming a

part hereof the figure represents a sectional view of a reproducer embodying my invention, the spring wire being shown in dotted lines in the position it assumes before being
50 secured to the solid block of gum rubber.

A is the diaphragm which is made of a fabric such as silk bolting cloth which is stretched and then shellaced or varnished
55 either before or after it is secured in the frame B of the reproducer. The reproducing point is formed of a metal wire C secured to the frame B at one side and extending toward the center of the diaphragm where its end is bent downwardly as shown. This wire is
60 sprung away from the diaphragm as shown by the dotted lines. It is attached to the center of the diaphragm by a solid block D of gum rubber which is cemented both to the diaphragm and the wire, the wire being drawn
65 in for the purpose so that the diaphragm will be normally held under tension.

What I claim is:

1. The combination, in a phonograph reproducer, of a diaphragm composed of a fabric filled with a hardening material, and a reproducing point operatively connected thereto, substantially as set forth.

2. The combination, in a phonograph reproducer, of a diaphragm composed of a stretched fabric such as bolting cloth filled with shellac or varnish, and a reproducing point operatively connected to said diaphragm, substantially as set forth.

3. In a phonograph reproducer, the combination with the diaphragm and reproducing point, of a solid block of gum rubber connecting such diaphragm and point, substantially as set forth.

4. In a phonograph reproducer, the combination with the diaphragm and reproducing point having a spring tension away from such diaphragm, of a solid block of gum rubber connecting such diaphragm and point, substantially as set forth.

This specification signed and witnessed this
22d day of May, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

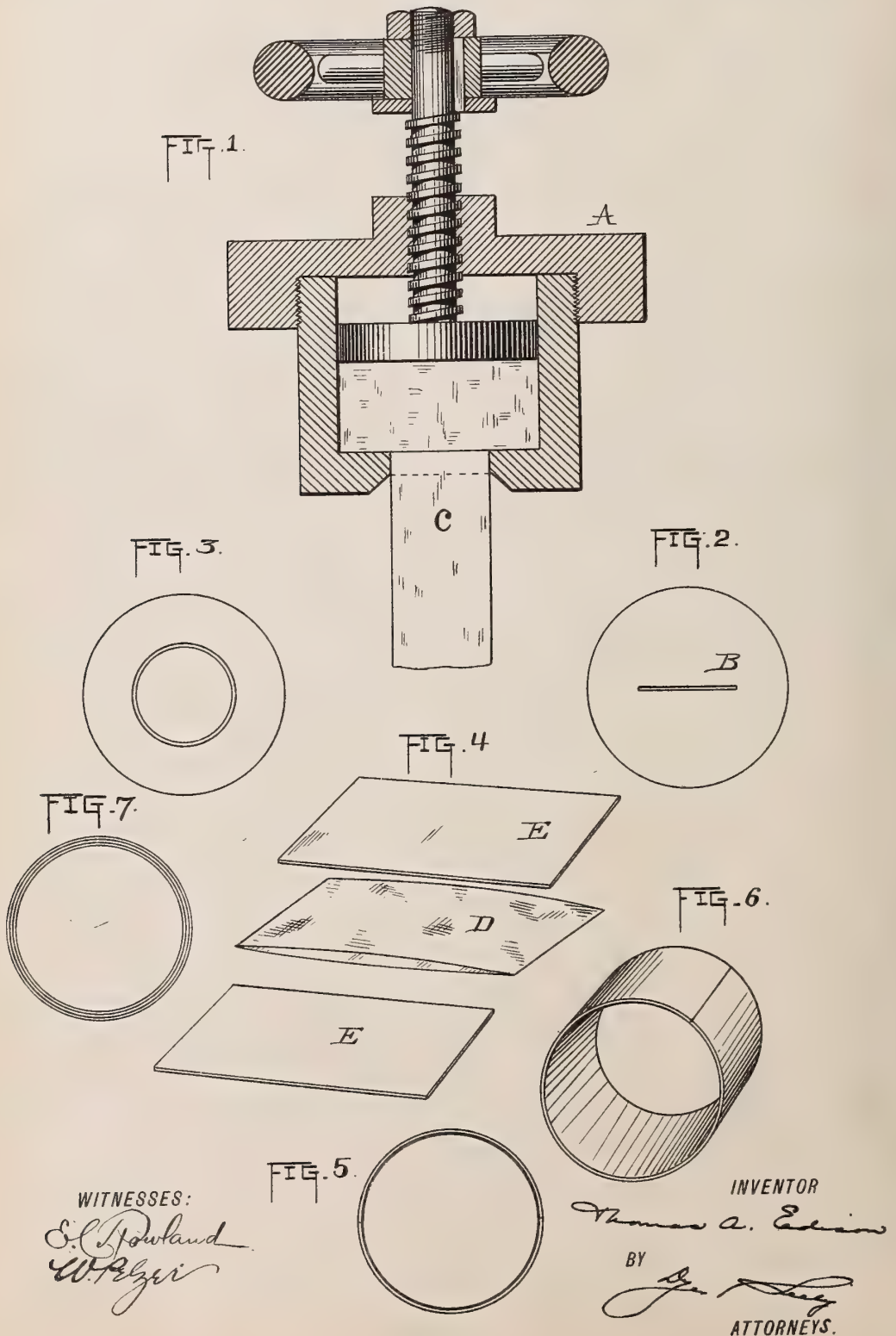
445110

(No Model.)

T. A. EDISON.
PHONOGRAM BLANK.

No. 488,191.

Patented Dec. 20, 1892.



UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 488,191, dated December 20, 1892.

Application filed January 19, 1889. Serial No. 296,876. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonogram-Blanks, (Case No. 812,) of which the following is a specification.

The object of this invention is to provide phonogram blanks or surfaces for receiving sound records in the phonograph, which shall be of a convenient and simple form and can be cheaply and readily manufactured, and which will be adapted to be conveniently packed in boxes and inclosed in envelopes for transmission by mail.

The main feature of the invention consists in the use of thin flexible sheets of wax or wax like material, which sheets either by themselves or combined with backings of other suitable material, are used as the recording mediums in phonographs. I may form such sheets of plastic flexible material, by rolling or pressing such material into sheets, but I prefer to produce them by forcing the material through an aperture of the desired form in a press. The sheets thus formed may be used in a variety of ways. Such sheets may themselves form flat recording surfaces for the phonograph, or they may be attached to backings of paper or similar flexible material and used as flat recording surfaces, or they may be formed into cylinders, either with or without an internal backing of paper or like material, or they may be placed upon rigid cylinders and used in the phonograph, or used in various other ways.

There are many compounds of wax or wax like material which may be employed for the purposes of my invention. What I prefer to use is a mixture of asphalt with Japan wax or pitches made from the distillation of fatty oils or combinations of fatty acids, any of which materials are equivalents of wax for the purposes of this invention. The proportions of the different substances will vary as the conditions differ and as sheets of different degrees of flexibility are required. Beginning with the asphalt alone, which is brittle even in thin sheets, the flexibility may be

brought to any desired degree by adding more or less of the Japan wax or equivalent flexible substance.

My invention is illustrated in the accompanying drawings:

Figure 1 illustrates the use of the squirting press for forming the thin sheets. Figs. 2 and 3 are bottom views of different forms of the press; Fig. 4 shows the preferred method of placing such thin sheets upon a paper backing; Fig. 5 illustrates a cylinder thus formed; Fig. 6, a cylinder formed from the plastic sheet alone; and Fig. 7 shows a cylinder formed of a number of plastic sheets which are intended to be torn off as they are used.

A quantity of the material, such as above described, is placed in the press A in the bottom of which is usually a slot or elongated aperture B, (Fig. 2.) The material is raised to such temperature as will insure its easy passage through the aperture, and the pressure is then applied, and the material forced in the form of a thin sheet C through the aperture, as illustrated in Fig. 1. I prefer to allow it to pass directly into water, so as to set it immediately, and prevent distortion while it is in a heated condition. After it is dry, it may be coated with fine powder, such as talc or kaolin, to prevent the surface from adhering to other objects, and the strip which has come from the press is then cut up into sheets of the required size. These sheets may, as above stated, be used in many different ways. The sheet may be bent around a forming cylinder and the ends overlapped and pressed together, the surplus material being removed by a cutting or scraping tool, or preferably the ends are made to meet and are joined together by the application of a heated wire or by the addition of a small amount of the softened material along the joint. By this means cylinders like that shown in Fig. 6 are formed. Instead of this however, a sheet of thin paper may be cut to the proper size and formed into a cylinder with its edges joined, and this cylinder is then collapsed into a flat double sheet as illustrated in Fig. 4, the collapsed cylinder being shown at D. The double sheet D is placed between two sheets E E of the flexible wax like material and the whole is submitted

to pressure. The backs of the sheets E, or the sheet D being previously moistened with a solvent of the flexible material, such as benzol, the sheets E are thus made to adhere firmly to the sheet D, whereby a collapsed phonogram blank is formed, which can be drawn out into a cylinder and placed upon the cylinder of the phonograph, or upon a false shell placed thereon. A cylinder drawn out into form for use is shown in Fig. 5.

Instead of a backing of paper, the thin flexible sheets formed into cylinders like Fig. 6 or used in sheet form, as flat recording surfaces, may be covered with a varnish, such as a solution of a suitable gum, like gum balata, in a solvent such as bi-sulphide of carbon. A number of sheets of this character can be formed into a composite cylinder as shown in Fig. 7, the different layers, one of which is affected at a time by the phonograph recorder, being torn off as they are used.

The squirting press may have an annular aperture as shown in Fig. 3, whereby the material may be forced out in the form of cylinders instead of in sheets.

What I claim is:

1. A collapsible phonogram blank consist-

ing of a cylinder of flexible material with separable sheets of flexible wax or wax like material placed thereon, substantially as set forth.

2. A composite phonogram blank, consisting of two or more separately removable layers of recording material, each layer being of such thickness that a record impressed on one layer will not be transmitted to a succeeding layer substantially as set forth.

3. A composite phonogram blank, consisting of a cylinder of two or more separately removable layers of recording material, each layer being of such thickness that a record impressed on one layer will not be transmitted to a succeeding layer substantially as set forth.

4. A phonogram blank having in combination super-imposed separable layers of flexible wax or wax like material, substantially as set forth.

This specification signed and witnessed this 10th day of January, 1889.

THOMAS A. EDISON.

Witnesses:

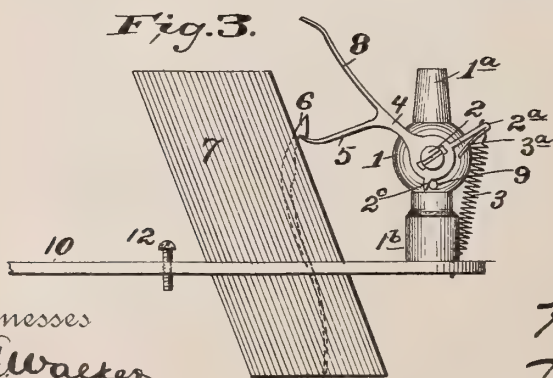
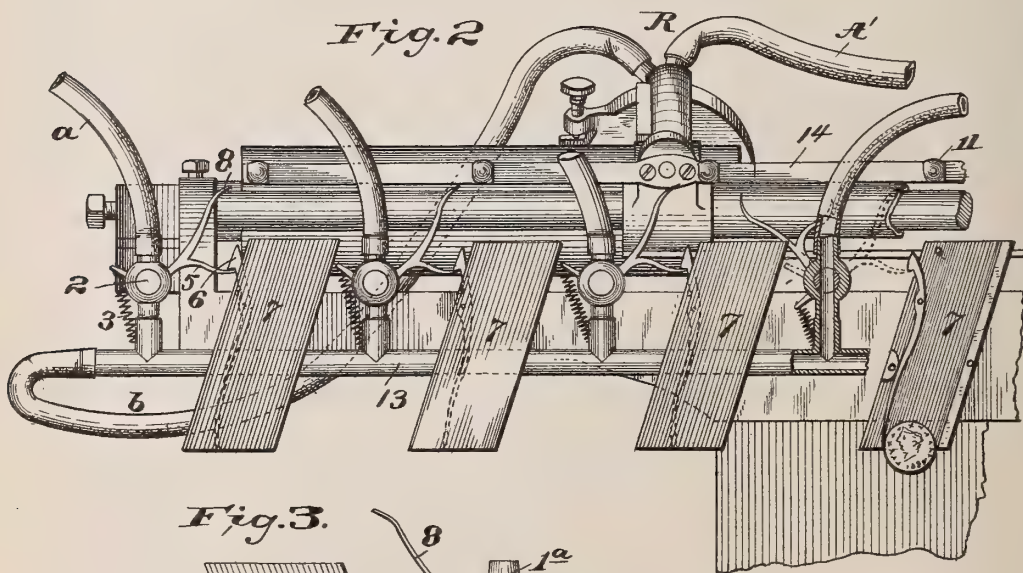
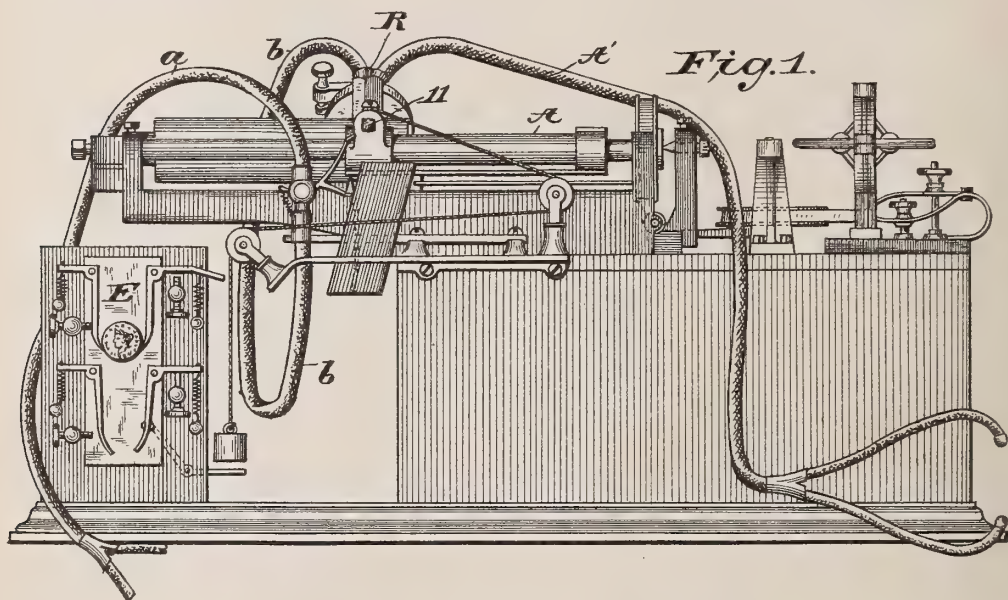
H. W. SEELY,
W. PELZER.

(No Model.)

H. HOESCHEN.
COIN CONTROLLED PHONOGRAPH.

No. 488,278.

Patented Dec. 20, 1892.



Witnesses
Ed. Walter
Edwin S. Clarkson

Inventor
Henry Hoeschen
by *F. W. Ritter Jr*
Attorney

UNITED STATES PATENT OFFICE.

HENRY HOESCHEN, OF OMAHA, NEBRASKA, ASSIGNOR TO ERASTUS A. BENSON, OF SAME PLACE.

COIN-CONTROLLED PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 488,278, dated December 20, 1892.

Application filed October 6, 1890. Serial No. 367,248. (No model.)

To all whom it may concern:

Be it known that I, HENRY HOESCHEN, a citizen of the United States, residing at Omaha, in the county of Douglas, State of Nebraska, have invented certain new and useful Improvements in an Automatic Coin-Controlled Phonograph; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, wherein—

Figure 1 is a rear elevation of a phonograph having applied thereto devices embodying my invention; Fig. 2 is an enlarged detail view of a portion of a phonograph, with a series of the devices embodying my invention applied thereto. Fig. 3, is an enlarged detached view of devices embodying my invention.

Like symbols refer to like parts wherever they occur.

My invention relates to the construction of that class of coin controlled mechanism intended for purposes of trade, and while of general utility for various forms of vending apparatus—as for instance where gases or fluids are to be automatically dispensed—has been especially devised for phonograph service and as an adjunct to coin controlled power actuated apparatus intended for public use.

The main feature of my invention consists in the combination with a tube, of a power actuated valve arranged within the same, and a coin chute provided with a trip and detent arranged to hold the valve against its power mechanism and normally close the tube.

A subordinate feature of the invention embraces the combination of the aforesaid devices with a phonograph and mechanism for closing the valve said mechanism actuated by the carriage or spectacle frame of the phonograph.

There are other, minor, features of invention, all as will hereinafter more fully appear.

For purposes of illustration I have chosen to show my invention attached to a phonograph A operated by a motor (not shown) controlled by coin chute mechanism E—such as is covered by Letters Patent No. 431,883, granted to L. F. Douglass, July 8, 1890; but as said devices form no part of the present invention—and have their equivalent in any coin controlled power operated phonograph—

I shall not herein described the same, nor shall I describe any portions of the phonograph except such as combine with my devices—

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

In the drawings I indicates a tube provided with a valve 2, adapted to be moved in one direction by a spring 3, a weight or equivalent motor, and having one arm 5, which is adapted to engage with a pivoted dog or detent 6 to lock the valve and hold it against the power of the motor, said dog or detent forming part of, or being arranged in a coin chute 7, so as to be tripped by a coin deposited in said chute. The valve 2 has also a second arm 8 adapted to be operated from a moving part of the apparatus to overcome the power of the spring weight or valve motor, move the valve 2 in reverse direction to that given it by the motor and to cause the arm 5 to engage with the detent or dog 6 of the coin chute.

It will be evident to a skilled mechanic that the valve may be either a flap—a rotary—or a slide valve, and that the motor may, in its simplest form be either a spring or a weight—but it will be equally evident that the rotary valve and the spring are the preferable devices, therefore while not limiting my invention thereto, I prefer to employ devices constructed substantially as shown in the drawings—that is to say, the tube 1 is provided with a nipple 1^a to receive the end of the induction tube—and, if a single or detached tube is used it may be enlarged as at 1^b (see Fig. 3) to receive the end of the induction tube which latter, if of flexible material will serve to pack the valve and prevent its vibration.

The valve 2, which should be accurately fitted, so as to move easily, yet without leaking, is preferably a rotary or plug valve provided with a short arm 2^a to which the power spring 3, that moves the valve in one direction, is attached at one end, the other end being secured to some fixed point. The rotary valve 2, is also provided with a second short arm 4, which is bifurcated to form the arm 5 that engages with detent 6 and the arm 8 by

which the valve is moved against the power of spring 3. In order to limit the movement of the rotary valve it is provided with a projection 2^c which engages a pin 9 in the tube or valve shell. In order that the valve may be set if desired by the direct action of a reciprocating object—such as the carriage of a phonograph—it is necessary that the arm 8 should be held in a yielding manner, so as to permit the passage of the object in one direction only—and to accomplish this, I provide a second small spring 3^a interposed between the arm 2^a and the stop 9, as shown in Fig. 3.

Where it is desired to apply to a phonograph but a single additional coin controlled valve of the character hereinbefore described, so as to accommodate a single additional auditor—I prefer to secure the tube 1 and the chute 7 to a base strip 10 (see Figs. 1 and 3.) and attach the same to the phonograph by means of the usual body holding screws, connecting the induction end 1^b of the tube 1 with the reproducer R by the flexible tube b, and securing the hearing tube a to the nipple 1^a. In order to close the valve from the carriage, a striker 11 is attached to the spectacle arm clamp screw, or at some other suitable point on the carriage. To adjust the relation of valve arm 8 to striker 11, the strip 10 is provided with an adjusting screw 12. Where it is desirable to employ a number of coin controlled valves, I prefer to interpose a main conducting tube 13 (see Fig. 2) the open end of which is connected with the reproducer R by the flexible tube b, said main conductor 13 having a series of branches, each provided with a power actuated valve, trip mechanism, and coin chute of substantially the character hereinbefore specified; and instead of a single striker 11, I attach to the spectacle arm clamp screw, or to any other suitable point on the carriage, a bar 14 having a series of strikers at intervals corresponding to the position of the several valves. It is of course understood that the coin chutes and valve mechanism will be inclosed within a suitable case having coin-slots corresponding with the chutes—but as the construction of such a case is within the knowledge and skill of the ordinary mechanic I have not shown or described the same.

In the case of the apparatus shown, the circuit to the motor having been closed by dropping coin in the coin-chute E—the phonograph carriage will be set in motion, and a single auditor may use the usual hearing tube A' of the apparatus which is attached directly to the reproducer R.

Any number of additional auditors, for which provision has been made, can at the same time hear the instrument by each one depositing a suitable coin in one of the chutes 7 to operate the valve interposed between the recorder R and the additional hearing tube chosen by the said auditor. The coin deposited in said chute 7 in its descent strikes the pivoted dog or detent 6 actuating the

same to release the arm 5, whereupon the power spring 3 moves the valve 2 in one direction and opens communication between the reproducer R and the hearing tube a held by the additional auditor. On the reverse or return movement of the phonograph carriage the striker 11 corresponding to the given valve 2 strikes the arm 8 overcoming the power of spring 3 and reversing the movement of valve 2 until the tube 1 is closed thus cutting off communication with the reproducer R. When this is accomplished the detent or dog 6, engages arm 5 and holds the valve closed until a coin is again deposited in said chute.

The combined valve, trip mechanism or detent and setting mechanism, herein described is simple and effective, and may be applied to a variety of vending apparatus, other than that shown; and in the case of phonographs and like apparatus, any character of motor, controlled by any suitable mechanism may be employed, without departing from the spirit of my invention.

Having thus described my invention what I claim and desire to secure by Letters Patent is—

1. The combination with a tube, of a power actuated valve arranged therein, a coin chute, and a trip and detent arranged therein and in such relation to the valve of the tube as to hold the valve and normally close the tube; substantially as and for the purposes specified.

2. The combination with a phonograph and its reproducer, of a hearing tube, a power actuated valve arranged in the hearing tube, a coin chute, and a trip and detent arranged in the coin chute and with relation to the valve of the hearing tube to hold the valve and normally close the hearing tube; substantially as and for the purposes specified.

3. The combination with a phonograph, its carriage, and reproducer, of a hearing tube provided with a power actuated valve, a coin chute, a trip and detent arranged in the coin chute with relation to the valve to hold the valve and normally close the hearing tube, and means on the carriage for bringing the valve within the control of the detent and trip, substantially as and for the purposes specified.

4. The combination, with a phonograph and its reproducer, of a series of hearing tubes, a main conducting tube having a series of branches, each provided with a normally closed valve said main tube interposed between the reproducer and the hearing tubes, and power mechanism for opening the valves when released by the detents a series of independent coin-chutes having detents which control the respective valves of the main conducting tube; substantially as and for the purposes specified.

5. The combination, with a phonograph and its reproducer, of a series of hearing tubes, an interposed main conducting tube, having branches, each provided with a normally

closed valve a series of coin chutes having detents which control the respective valves of the main conducting tube, and means for actuating the several valves from the carriage of the phonograph to place the valves within the control of the respective detents; substantially as and for the purposes specified.

6. The combination with a tube of a power actuated rotary valve, a stop to limit the rotation of the valve by the power devices, an arm which projects from the valve, and a coin chute provided with a trip and detent arranged in the path of and adapted to engage the arm which projects from the valve—; substantially as and for the purposes specified.

7. The combination with a tube, of a power actuated valve having a bifurcated arm projecting therefrom, a coin chute having a trip and detent arranged with relation to the bifurcated arm of the valve to engage one fork thereof, and suitable means adapted and arranged to move in the path of said bifurcated

arm, and engage the other fork of said arm; substantially as and for the purposes specified.

8. The combination with a tube, of a power actuated valve having a bifurcated arm projecting therefrom, a coin chute provided with a trip and detent arranged in the path of one fork of said arm, means adapted and arranged to move in the path of said bifurcated arm and engage the other fork of said arm, a stop for said valve, and a relief spring which permits the bifurcated arm to recede before the reverse movement of the device which moves the valve into engagement with the detent; substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 1st day of October, 1890.

HENRY HOESCHEN.

Witnesses:

ERASTUS A. BENSON,
J. B. CARMICHAEL.

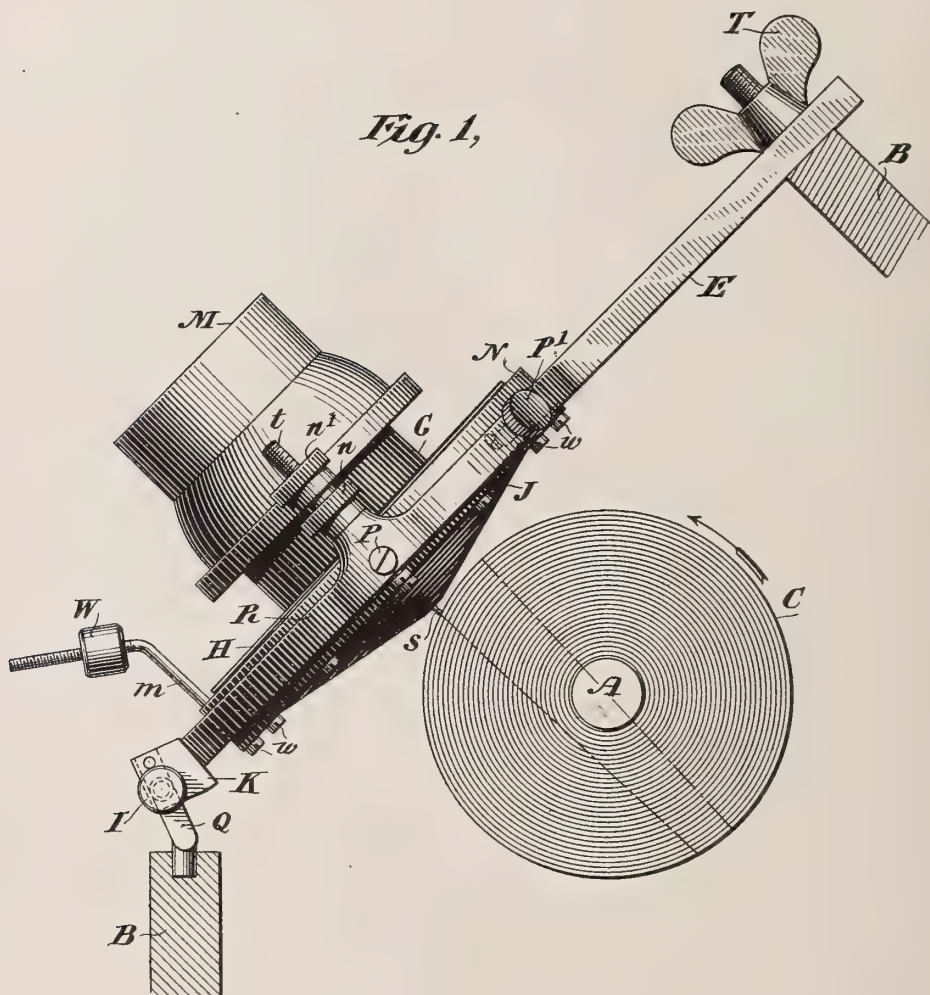
(No Model.)

2 Sheets—Sheet 1.

G. BETTINI.
PHONOGRAPH.

No. 488,379.

Patented Dec. 20, 1892.



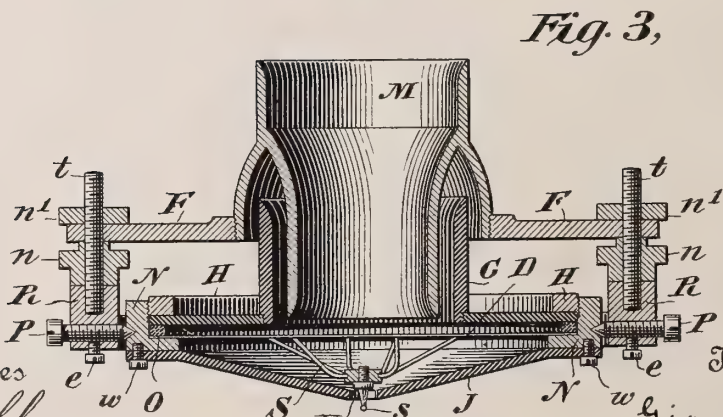
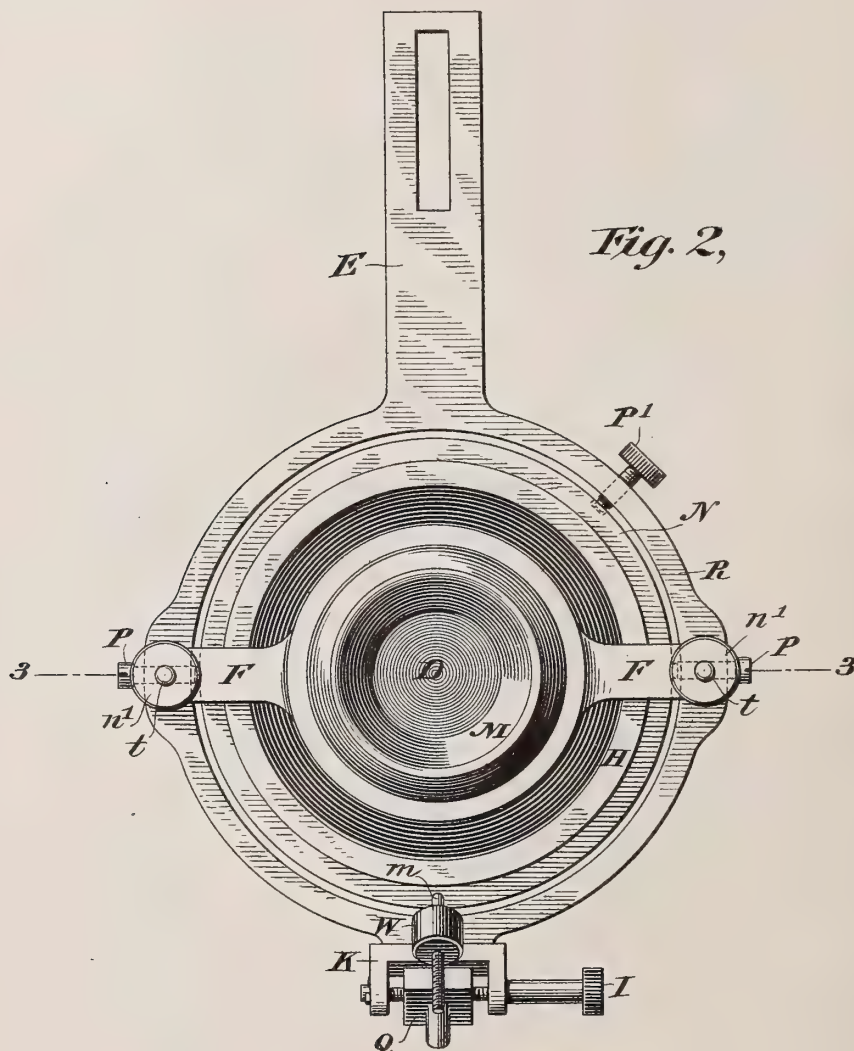
Witnesses
C. E. Ashley
H. W. Lloyd.

Inventor
Gianni Bettini
By his Attorney
Charles J. Kintner

G. BETTINI.
PHONOGRAPH.

No. 488,379.

Patented Dec. 20, 1892.



Witnesses
C. E. Ashley
H. W. Lloyd.

Inventor
Gianni Bettini
By his Attorney
Charles J. Kintner

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 488,379, dated December 20, 1892.

Application filed January 27, 1892. Serial No. 419,409. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, a subject of the King of Italy, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Methods of and Apparatus for Recording and Reproducing Articulate or other Sounds, of which the following is a specification.

In order that my invention may be fully understood, reference is had to the following specification taken in connection with the accompanying drawings, which specification is a full, clear and exact description of the invention, such as will enable others skilled in the art to which it relates, to make and use same.

My invention is directed particularly to improvements in novel methods of and means for automatically regulating the position of a phonographic diaphragm with relation to the recording or reproducing cylinder in such manner as to obtain from such apparatus a more perfect record and a better reproduction thereof, than is now obtainable with any existing apparatus of a kindred nature known to me.

It is a well known fact that in the use of the phonograph the record cylinders are often of irregular surface before the record is produced thereon; or, even if the surfaces have the desired conformation at the time of producing the record, the cylinders often warp or change their configuration from changes in temperature, careless handling, or, various other reasons. It is also a fact that with existing forms of phonographic apparatus during the production of the record there results often times a production of a false record due to extraneous sounds acting upon the under surface of the diaphragm at the same time that the operating sounds are entering the apparatus through the proper channel on the upper side thereof.

My invention has for its object the avoidance of these objectionable features, and to this end it consists—

First—In a novel method of and means for supporting the diaphragm whereby it may always assume a proper relation to the cylinder regardless of the conformation thereof—
Second—In novel means for protecting the

diaphragm from the evil effects of extraneous sounds—Third—In details of construction hereinafter set forth, and particularly pointed out in the claims at the end of this specification.

Referring now to the drawings in all of which like letters of reference represent like parts wherever used—Figure 1 is a side elevational view illustrating my improvement—Fig. 2 is a plan view of the same—and Fig. 3 is a cross sectional view thereof taken on line 3—3 Fig. 2.

C represents a phonogram cylinder supported in the usual manner upon a rotary axis (A).

B B represent parts of the frame, which carry adjustably the diaphragm supporting arm (E;) said arm being enlarged in the usual manner at its lower end and provided with a slot at its upper end for securing it adjustably in position through the agency of a thumb nut (T) the lower portion of the supporting arm being provided with a fork (K) in which is secured the adjusting screw (I) threaded into a lug or arm (Q) which in turn is fixedly secured to the part (B).

D represents the diaphragm made preferably of metal having attached to its lower side a stylus, or recording, or reproducing point (s) the same being secured to the diaphragm by the agency of a spider (S) substantially as described in a prior patent No. 409,004 granted to me on the 13th day of August, 1889. This diaphragm is secured in position in a supporting ring (N) and securely held in place by a washer (O) and a sound concentrator (G) by a ring nut (H).

F is a cross bar adjustably secured to the supporting arm (E) by a pair of screw rods (t t) and thumb nuts (n n' n n'). At the center of this cross bar is secured a mouth piece (M) the lower end of which projects downward into the upper or extended portion of a sound concentrator (G) so as to convey all of the sound which enters the mouth piece (M) to the surface of the diaphragm. The lower end or throat portion of the mouth piece (M) is sufficiently diminished in size to permit of the necessary vibratory movement which may be given to the surrounding sound concentrating portion (G) as the diaphragm tilts back and forth upon its pivotal supports,

which will now be described. The diaphragm supporting ring (N) is pivotally secured in position to the supporting arm (E) by a pair of screws (P) located on diametrically opposite sides and in a plane parallel with the axis (A) of the phonogram cylinder. *ee* are set screws for securing the screws (P) when in proper adjustment. P' is a thumb screw for uniting the diaphragm ring fixedly with the arm or support (E) when desired. W is an adjustable weight secured on the screw threaded end of an arm (*m*) carried at the lower edge of the diaphragm ring (N). J is a protector or shield made preferably of non-resonant material for shielding the lower side of the diaphragm from the effects of any extraneous sound. This shield (J) is preferably of conical shape, as shown, being secured to the diaphragm ring (N) by screws (*w w*) and provided at its apex with an opening (V) of sufficient size to permit of the free movement of the stylus (*s*).

The operation of the apparatus is as follows:—The diaphragm having been properly adjusted as to the delicacy of its pivotal or rocking motion by the screws (P P) (*ee*) and through the agency of the adjustable weight (W) with the recording stylus (*s*) in the position shown in Fig. 1, the apparatus is ready to make or reproduce a record. It will be noticed, as shown in Fig. 1, that the record producing or reproducing stylus (*s*) does not bear normally upon the phonogram cylinder (C) and that inasmuch as the diaphragm is pivotally supported and is acted upon by the weight (W) which tends to move the stylus forward in a reverse direction to that of the phonogram cylinder, it will therefore be apparent that if any inequality occurs in the surface of the cylinder this adjustment will compensate for it by causing the recording or reproducing stylus to assume different angular positions with relation to the axis of the cylinder and to operate at all times with the best effect and to make a clear and well defined record. The diaphragm D and its supporting ring N secured in the arm or support E will therefore be given a rocking motion by the stylus *s* as it follows the irregularities of the surface or record of the phonogram cylinder C which rotates in the direction of the arrow (see Fig. 1) and inasmuch as the major portion of the weight of these parts is thus supported free of the cylinder or surface delicate adjustment is effected by the weight W, and the stylus will follow the surface or record giving always an approximately uniform pressure, thereby assuring either a perfect record or a perfect reproduction thereof. It will be noticed also that by virtue of the adjustable mouth piece (M) and the sound concentrator (G) I am enabled to obtain a maximum effect upon the upper surface of the diaphragm and to transmit through this diaphragm and its spider sustained recording stylus, all of the sound waves. It is also apparent that there can be no material effect

produced upon the under side of the diaphragm from any extraneous sounds, because of the protector or shield (J). The lateral and vertical adjustments of the diaphragm with relation to the phonogram cylinder are effected through the agency of the thumb nut (T) the thumb screw (I) yoke (K) and support or lug (Q).

It will of course be understood that all of the improvements herein described are equally applicable to either the recorder or reproducer of a phonograph at will.

I am aware that attempts have heretofore been made to overcome the defects due to irregularities in phonogram cylinders by various means—as for instance:—By pivoting the recording or reproducing stylus to the diaphragm and regulating the throw or movement of such pivoted stylus by a weight or analogous device, and I do not claim broadly means for accomplishing this result.

I am also aware that it is old in the art to pivotally sustain a recording or reproducing diaphragm so that the weight of the entire diaphragm and its supporting ring or frame is sustained by the stylus resting upon the phonogram surface, and I make no claim hereinafter broad enough to include such a structure. I am not aware, however, that any one has heretofore pivoted the diaphragm proper in a sustaining frame over the phonogram cylinder or surface so that the weight of the diaphragm and its attached parts is sustained independent of the phonogram surface and in such manner that irregularities of said surface cause the diaphragm to turn about its points of support and the point of the stylus to assume different angular positions with relation to the axis or the phonogram cylinder, and my claims are generic in this particular.

I am aware also that it is old in the art to convey the sound waves to an inclosed chamber located beneath the diaphragm, the said diaphragm having its upper surface entirely inclosed or protected from extraneous sounds, the recording or reproducing stylus extending through a perforation in the lower chamber and being provided with link and lever connections, as shown and described in patent to J. H. White No. 467,530, granted January 26, 1892, and I make no claim upon this feature of my invention broad enough to include such a structure. With such a structure as shown in Figs. 1 and 3 of the drawings of the aforesaid patent air is confined in the chamber above the diaphragm without any means of escape acting therefore as a cushion, while in the structure described and claimed by me the chamber above the diaphragm is used to receive the sound waves without any vent or escape, the lower or protecting shield being provided with a perforation through which the stylus passes, thereby permitting the escape of the air and avoiding the evil effects of an air cushion. It is also to be understood that although I have shown

and described a phonogram cylinder of the usual type in connection with my improvements I may use a phonogram surface of any preferred form, the application of the novel principles hereinbefore described and hereinafter claimed being equally as well adapted to such surfaces as to cylinders.

Having thus described my invention what I claim and desire to secure by Letters-Patent of the United States is:—

1. The described method of compensating for the effects of irregularities in a phonogram cylinder or surface consisting in supporting the weight of the diaphragm and its attached parts free of the cylinder or surface and simultaneously giving to it a rocking motion as the cylinder or surface moves or advances, whereby the recording or reproducing stylus is caused to assume different angular positions.

2. The described method of compensating for irregularities of a phonogram cylinder consisting in supporting the weight of the diaphragm and its attached parts free of the cylinder or surface and simultaneously varying the angular relation of the stylus to the axis of the cylinder, said stylus being rigidly secured to the diaphragm.

3. The described method of compensating for irregularities in the surface of a phonogram cylinder consisting in giving to a rigidly supported stylus a vibrating motion in the

direction of the cylinder's rotation and about a fixed or axial line of support in a plane substantially parallel with the axis of the cylinder. 35

4. A stylus carried by a diaphragm pivotally secured to a support and provided with adjustable means as a weight for causing the stylus to vary its angular relation so as to conform to the phonogram surface, substantially as described. 40

5. A phonograph having a diaphragm provided with a sound receiving chamber on one side with an inlet thereto for the sound waves in combination with a protecting shield on the other side which covers the entire surface of the diaphragm and has a perforation through which the recording or reproducing stylus extends substantially as described. 45

6. A phonograph provided with a sound protector or shield which covers the entire face of the diaphragm and has an opening through which the recording stylus projects, substantially as described. 50

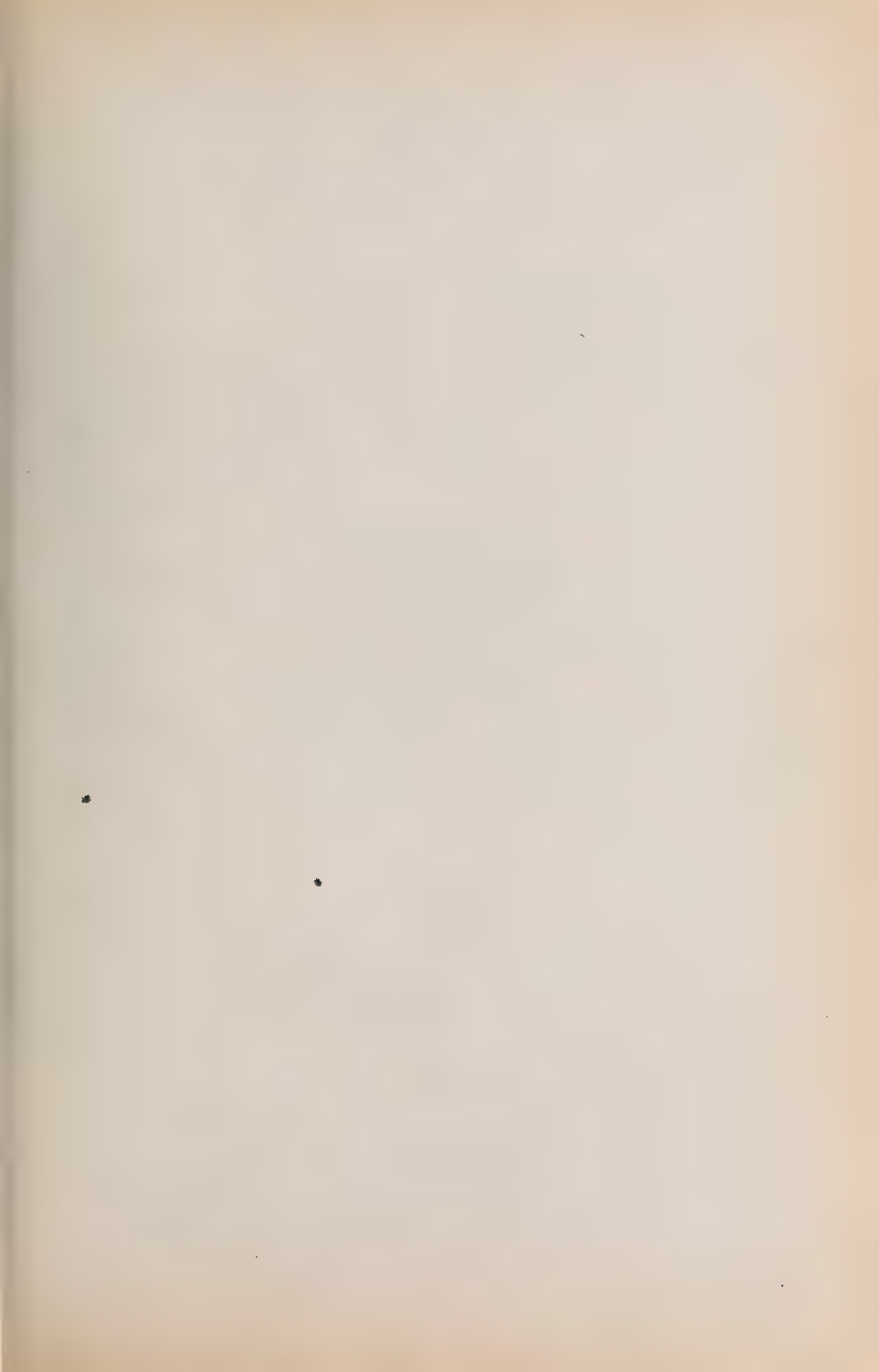
7. A phonograph having a pivoted diaphragm with a sound concentrating chamber on one side and a sound protector or shield on the other through which the stylus projects substantially as described. 55

GIANNI BETTINI.

Witnesses:

C. J. KINTNER,
F. GRIESSMAN.

copy



(No Model.)

G. BETTINI.
PHONOGRAPH.

No. 488,380.

Patented Dec. 20, 1892.

Fig. 4.

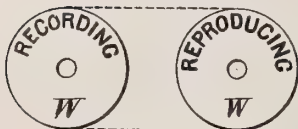


Fig. 1.

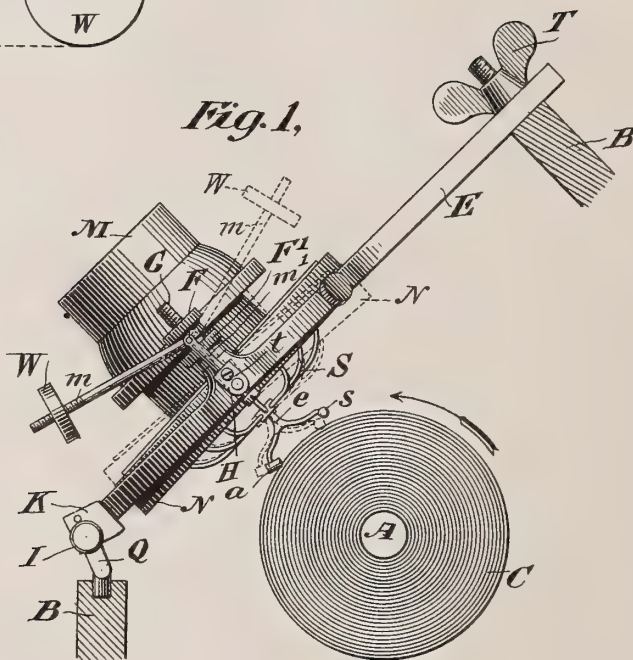


Fig. 2.

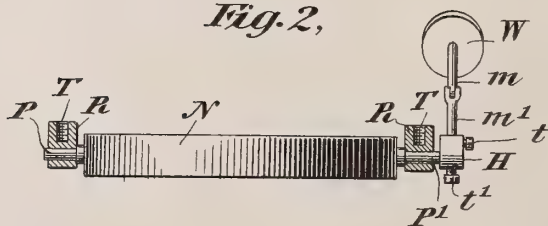
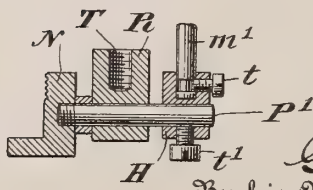


Fig. 3.



Witnesses

C. E. Ashley
H. W. Lloyd.

Inventor

Giamini Bettini
By his Attorney
Charles J. Kintner

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 488,360, dated December 20, 1892.

Application filed March 14, 1892. Serial No. 424,814. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, a subject of the King of Italy, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention will be fully understood by reference to the accompanying drawings, in which—

Figure 1 represents a side elevational view of a phonogram cylinder, and a phonogram provided with my improvements—Fig. 2 is a part cross sectional, part end elevational view showing a portion of the apparatus—Fig. 3 is an enlarged detailed sectional view of those parts of the apparatus shown on the right hand in Fig. 2—Fig. 4 is an enlarged elevational view of the opposite sides of the regulating weight with the words “recording” and “reproducing” situated on opposite faces thereof.

Referring now to the drawings in detail in all of which like letters of reference represent like parts—B B represent parts of the frame which carry the adjustable diaphragm supporting arm (E) secured at the upper end by a thumb nut (T) and at the lower end by a fork (K) standard (Q) and adjustment screw (I), the enlarged portion (R) of the support (E) constituting a ring in which the diaphragm is pivotally sustained in a support (N) by pivots (P P').

M is a mouth piece adjustably sustained by two pairs of nuts (F F') upon screw rods (G) adapted to be screwed into the screw holes (T T) in the ring (R), the mouth piece being supported entirely independent from the diaphragm, and the latter having a spider (S) on its lower side to which the stylus is attached.

The apparatus as so far described is fully disclosed in my prior application above referred to, and the present invention embodies the additional feature of a record producing stylus (a) and a reproducing stylus (s) both lying in the same plane and attached to a single standard (e), which, in turn, is secured to the spider (S). On the outer end of the pivot (P') which carries the diaphragm supporting ring (N) is secured, by a set screw (t'), a short standard (H) in the upper end of

which is pivoted a rotatable standard (m') held in place by a set screw (t) and provided at its upper end with a pivoted extension (m), screw threaded at its free end to receive an adjustable weight (W), on one side of which is printed, engraved, or otherwise prepared the word “recording” and on the opposite side the word “reproducing.”

The operation of the apparatus is as follows:—Suppose the phonogram cylinder (C) upon the axis (A) to be revolving in the direction of the arrow, and the weight (W) in the position shown on the left in full lines. Under this condition of affairs the record producing stylus (a) is held in contact with the surface of the cylinder and is caused to make a record on producing sounds in the mouth piece (M), while the record reproducing stylus (s) attached to the same spider (S) is held out of contact with the cylinder. After the record is thus produced and the cylinder restored to its starting point in the usual way the operator rotates the standard (m') through an angle of one hundred and eighty degrees carrying with it the weight (W) and pivoted extension (m). As soon as it is released, therefore, the weight (W) causes the diaphragm to be tilted upon the standards or pivots (P P') into the position shown in dotted lines, thereby placing the record reproducing stylus (s) in contact with the cylinder and removing the record producing stylus (a) so that when the cylinder is again set in motion the record will be faithfully reproduced from the same diaphragm.

When the apparatus is in the position shown in full lines in Fig. 1, the word “recording” will be in full view of the operator, thus indicating to him that the recording stylus (a) is in operative position. When, however, the weight (W) and arm (m) are revolved into the other position shown in dotted lines so that the reproducing stylus is in operative position the word “reproducing” will be in full view of the operator. It will be apparent therefore, that I provide a simple means of indicating to the operator, whether or not the apparatus is in condition for producing or reproducing a record, thus avoiding the possible mutilation of a cylinder upon which a record has already been produced.

I am aware that it is not broadly new with me to utilize a single diaphragm in connection with two independent styles, one of which is designed to make a record, and the other to reproduce it, as I know that a phonograph has heretofore been constructed in which two styles have been pivotally secured to a pivoted bar or rod, which, in turn, was secured to a single diaphragm, and I make no claim hereinafter broad enough to include such a structure. I am not aware, however, that any one has heretofore rigidly secured a record making and a record reproducing stylus to a single diaphragm in such manner as to adapt it to act for producing or reproducing a record at will, and my claims in this particular are of a generic nature. Nor am I aware that any one has heretofore devised a pivoted diaphragm carrying two styles, one of which is adapted to make a record upon a phonogram surface, and the other to reproduce it in combination with indicating mechanism which serves the double function of an indicator and a means for holding the styles in operative relation with the surface, and my claims are also generic in this particular.

Having thus described my invention what I claim and desire to secure by Letters-Patent of the United States is:—

1. A phonograph having a record producing stylus and an independent record reproducing stylus, said styles being attached by a rigid support to the diaphragm or other resonant medium substantially as described.

2. In a phonograph a pair of styles secured by a rigid support to a diaphragm and located in the same plane whereby one may be utilized for producing a record and the other for reproducing it—substantially as described—

3. In a phonograph a pair of styles secured to a diaphragm by a spider, one style being

adapted to produce a record and the other to reproduce it—substantially as described—

4. In a phonograph a pivoted diaphragm having a record producing stylus and a second or record reproducing stylus rigidly secured to it—substantially as described—

5. In a phonograph a pivoted diaphragm having a record producing stylus, and a second or record reproducing stylus rigidly secured to said diaphragm in combination with means for causing either stylus to bear upon the phonogram surface—substantially as described—

6. In a phonograph, a loosely pivoted diaphragm having a pair of styles rigidly secured to it in combination with adjustable means for causing either stylus to act at will—as described—

7. In a phonograph a loosely pivoted diaphragm; a pair of styles rigidly secured to said diaphragm in combination with reversible adjustable means for utilizing either style at will—as described—

8. In a phonograph a pair of styles located in a vertical plane and rigidly secured to the diaphragm—as described—

9. In a phonograph a pivoted diaphragm carrying a pair of styles in combination with a reversible weighted indicator adapted to indicate which style is in contact with the surface and to maintain it in that position until reversed, substantially as described.

10. A phonograph having a pair of independent styles rigidly secured to a pivoted diaphragm and a reversible weighted lever adapted to cause either style at will to bear upon the phonogram surface.

GIANNI BETTINI.

Witnesses:

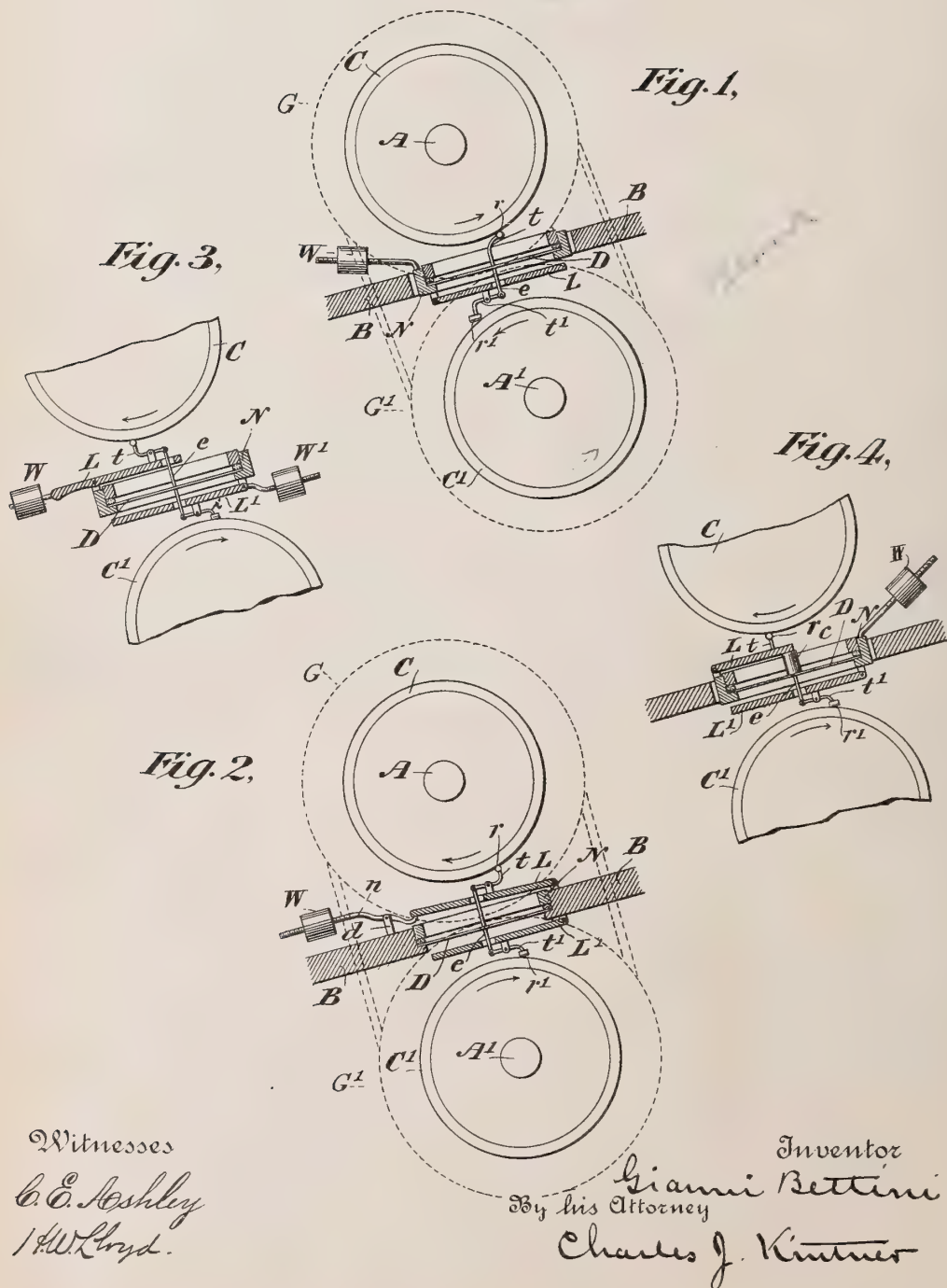
C. J. KINTNER,
H. JARVIS PATTEN.

(No Model.)

G. BETTINI.
PHONOGRAPH.

No. 488,381.

Patented Dec. 20, 1892.



Witnesses

C. E. Ashley
W. Lloyd.

Inventor

Giammi Bettini
By his Attorney
Charles J. Kinner

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 488,381, dated December 20, 1892.

Application filed March 14, 1892. Serial No. 424,815. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, a subject of the King of Italy, and a resident of New York, in the county of New York and State of New York, have made certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention is directed particularly to a novel apparatus for duplicating phonographic records, and its object is to simplify and cheapen the present expensive methods of making records where it is desired to place the same record upon many phonogram surfaces or cylinders. I accomplish this object with the apparatus hereinafter described, but particularly pointed out in the claims at the end of this specification.

In order that my invention may be fully understood reference is had to the accompanying drawings, in all of which like letters of reference represent like parts wherever used.

All of the figures of the drawings (four in number) are sectional views of modified forms of my novel apparatus designed to accomplish the result above indicated—

Referring first to Figure 1—A represents the axis—and C a phonogram cylinder carried thereby, and upon which has been placed a record which it is desired to duplicate mechanically.

B B represent parts of the frame of the apparatus which sustain my reproducing device.

C' represents another phonogram cylinder upon which it is desired to make a duplicate record, this cylinder being carried by an axis (A') parallel to the axis (A).

G G' are pulleys carried by the axes A and A' and connected together by a belt or cord so that they will rotate with the axes (A and A') and cylinders (C C').

N is a diaphragm supporting ring in which is secured a diaphragm D, this ring being in this instance pivotally supported on an axis parallel with the axes (A and A') and provided with a regulating arm and adjustable weight (W). To the upper side of the diaphragm is attached a record reproducing stylus (t) and to the lower side of this diaphragm is secured a pivoted recording or reproducing stylus (t') the fulcrum of which is attached to a lever (L) the arrangement being such that the free end of the pivoted re-

producing stylus (t') is adapted to bear upon the surface of the duplicating phonogram cylinder (C'). The lever (L) it will be observed is pivoted at one end to the ring (N), and the arrangement is such that the reproducing stylus (t') will follow accurately the movements of the stylus (t).

The operation of this apparatus is as follows:—The axis (A) is set in motion in its usual way in the direction of the arrow, the stylus (t) having been properly adjusted in connection with the original record upon the phonogram cylinder (C) and the recording or record producing stylus (t') having been properly adjusted to bear upon the surface of the cylinder (A') with the desired pressure through the agency of the adjustable weight (W). The pulley (G) therefore, transmits to the pulley (G') motion in the direction of the lower arrow, so that the cylinder (C') rotates in the same direction as does the cylinder (C), and a correct record is therefore, transmitted from the stylus (t) through the link (e) and diaphragm (D) to the pivoted recording or record producing stylus (t'), thus causing the part *r'* to cut or produce in the cylinder (C') an accurate duplication of the record on the cylinder (C). After the record has been thus duplicated the second cylinder (C') may be removed and the operation repeated with duplicate cylinders for an indefinite number of times. In the form shown in Fig. 2 the diaphragm (D) is fixedly secured to the parts (B) of the frame and the adjustable feature, [which is attributable in Fig. 1 to the pivoted diaphragm, adjustable weight (W) and pivoted lever (L)] is effected through the agency of two pivoted levers (L and L') adjustable weight (W) and a third lever (n) the latter pivotally secured to one part (B) on a standard (d) with its short arm under the free end of the upper lever (L). In this instance it will be noted that the styles (t and t') are pivoted respectively to the levers (L and L') and are joined to each other through the agency of the diaphragm (D) and a rigid wire or connecting link (e).

The mode of operation of the form shown in Fig. 2 is not essentially different from that shown in Fig. 1.

In the form shown in Fig. 3, the diaphragm is rigidly supported, the same as in Fig. 2 and

adjustable weights (W and W') are secured to the outer ends of the levers (L and L') the styles (t and t') being pivotally secured to these levers and attached to each other through link (e) and diaphragm (D).

In Fig. 4 the diaphragm ring (N) is pivoted to the parts (B B) the same as in Fig. 1, and the stylus (t) is attached directly to the free end of the lever (L). This lever is pivoted at its other end directly to the diaphragm ring (N) and its free end connected directly to the diaphragm by a piece of cork (c), the diaphragm, in turn, being connected to the lower stylus (t') by a link (e). The stylus (t') is pivoted as in Fig. 1 to a lever (L').

In Figs. 3 and 4, the pulleys (G and G') are not shown although it will be understood that some means of operatively connecting the two phonogram cylinders (C C') will always be required. Of course other means than pulleys may be utilized for rotating the cylinders (C and C') together. The operation of these modified forms is entirely obvious in view of the description and the mode of operation of the modified forms illustrated in Fig. 1.

I do not limit myself to the specific forms of mechanism herein shown and described for duplicating phonogram records, as I believe I am entitled to claim broadly apparatus for duplicating such records through the agency of connected pivoted styles and my claims are generic in this particular.

I am aware of the record reproducing apparatus shown in Figs. 1 and 2 of the drawings of patent to S. Taintor, No. 341,287, granted May 4, 1886, and I make no claim hereinafter broad enough to include such a structure or any method involved in the use of such structure.

Having thus described my invention, what I claim and desire to secure by Letters-Patent of the United States is:—

1. A pair of independent phonogram surfaces, one of which has a record on its face; intermediate gearing as a belt and pulleys for causing said surfaces to move simultaneously; a stylus adapted to follow the conformation of the record, and a second stylus with intermediate connections adapted to reproduce the record on the second surface—substantially as described—

2. A pair of independent phonogram surfaces, one of which has a record on its face; intermediate gearing as a belt and pulleys for causing said surfaces to move together; a stylus resting on the record on the first surface; a second stylus resting on the face of the second surface, and an intermediate elastic or yielding support as a diaphragm with adjustable connections, as described—

3. A pair of independent phonogram cylinders sustained by parallel axles geared together, one of said cylinders having a record on its face; a reproducing stylus adapted to follow this record; a recording stylus attached to the reproducing stylus by intermediate connections, and adapted to make a duplicate record on the face of the second cylinder—substantially as described—

4. A pair of phonogram cylinders sustained by parallel axles geared together, one of said cylinders having a prepared record on its face; a pivoted reproducing stylus fulcrumed to a lever; a pivoted record producing stylus resting normally on the face of the second phonogram cylinder and fulcrumed to a second lever with connections between said styles, whereby a duplicate record is made upon the face of the second cylinder, as the two are revolved—substantially as described—

GIANNI BETTINI.

Witnesses:

C. J. KINTNER,
F. GRIESSMAN.

(No Model.)

M. O. ANTHONY.

AUTOMATIC FEED AND RETURN MECHANISM FOR PHONOGRAPHS.

No. 489,519.

Patented Jan. 10, 1893.

FIG. 1.

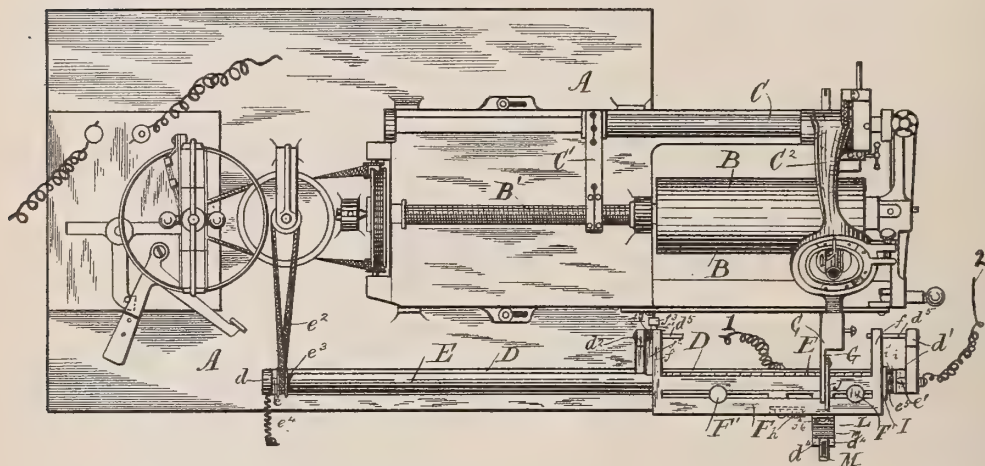


FIG. 3.

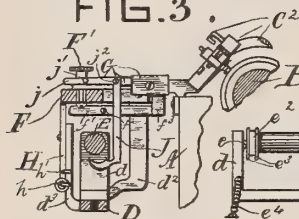


FIG. 2.

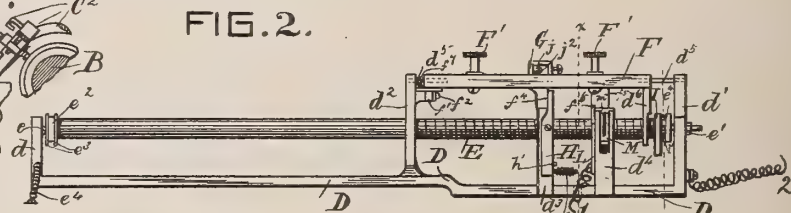


FIG. 4.

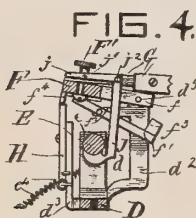


FIG. 5.

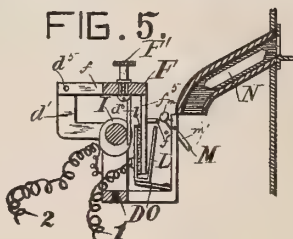


FIG. 6.

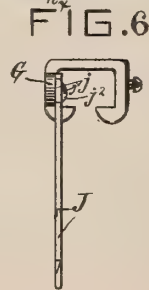
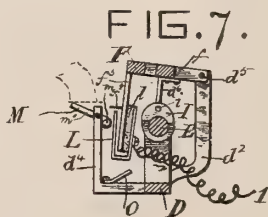


FIG. 7.



Witnesses

Frank Davis

David S. Oliver

Inventor

Marcus O. Anthony

By his Attorney *Geo. Murray*

UNITED STATES PATENT OFFICE.

MARCUS O. ANTHONY, OF CINCINNATI, OHIO, ASSIGNOR OF THREE-FIFTHS
TO JAMES L. ANDEM, OF SAME PLACE.

AUTOMATIC FEED AND RETURN MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 489,519, dated January 10, 1893.

Application filed November 20, 1890. Serial No. 372,019. (No model.)

To all whom it may concern:

Be it known that I, MARCUS O. ANTHONY, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Automatic Feed and Return Mechanisms for Phonographs, of which the following is a specification.

The object of my invention is to provide an automatic coin actuated feed and return mechanism for phonographs, whereby the machine may be entirely inclosed and protected from injury either from carelessness ignorance or rough handling, by thoughtless or evil disposed persons. It is especially intended for that class of exhibition machines which are placed in public places to reproduce popular music or declamations for the amusement of those who may drop a coin in a slot in the case inclosing the machine. In instruments of this class now in use, a push rod or lever projects through the case which is connected to the sensitive mechanism within. It is requisite to operate this rod or lever after the coin is dropped in, in order to set the machine in motion. I have found by experience that the handling of this rod or lever by careless or inexperienced persons deranges the sensitive mechanism of the phonograph, frequently injures the phonogram and causes a drawling sound at the commencement, and ending, of the piece upon the phonogram. All of these defects are remedied by my invention, which I will now proceed to describe in detail, in connection with the accompanying drawings, after which I will particularly refer to and point out its novel features in the claims.

Referring to the drawings in which like parts are indicated by similar reference letters and numerals wherever they occur throughout the various views. Figure 1. is a plan view of a phonograph detached from its inclosing case, and provided with my improvements. Fig. 2. is a front elevation of the attachment. Fig. 3. is a transverse vertical section taken through line x, x , of Fig. 2, looking to the left, with the parts in position they occupy when the reproducer carriage or spectacle frame is coupled to the lead screw, which is formed upon the shaft of the phonogram carrier. Fig. 4 is a similar view with the carriage or spec-

tacle frame disconnected from the lead screw and coupled to the retracting screw. Fig. 5 is a similar view in the same plane with the parts in position shown in Fig. 3. Fig. 6 is a detail view in front elevation of the device for coupling the carriage to the retracting screw. Fig. 7. is a detail view in vertical section through line y, y , of Fig. 2, looking to the left.

In Fig. 1 A represents the plate upon which the body of the well known Edison phonograph is mounted, the phonogram cylinder B, lead screw B', traveling carriage C, the coupling arm C', rocking spectacle frame C², which carries the reproducer, and the mechanism for actuating, them as well as the bearings or supports in which they are mounted, are well known and need not therefore be specifically described.

All of my improvements are mounted upon or supported in a standard or frame which is secured by a pivot screw upon the cabinet top in front of the phonograph.

The frame in which my improvements are mounted consists of base bar D, end uprights d, d' , and intermediate uprights d^2, d^3 , and d^4 , all of which are preferably cast in a single piece.

The return screw E, which has a much greater pitch than the lead screw, is mounted on centers e, e' , in the end uprights d, d' . The screw shaft E, is revolved by a belt e^2 , passing over pulley e^3 , which is secured upon the shaft near one end, and over a pulley driven by the motor which operates the phonograph; the belt is kept tight by a coiled spring e^4 , one end of which is secured to the frame D, and the opposite end by a screw to the cabinet top. (Not shown.)

F is a frame swung upon pivot pins d^5 , which are secured to the uprights d', d^2 , and pass through the arms of the frame to allow the frame a limited longitudinal movement. The frame is counterpoised by a weighted lever arm f' , which is fulcrumed at f^2 , upon the upright d^2 , the inner end of this lever bears upon the under side of the free end of the frame, and the opposite end of the lever is provided with a weight f^3 .

To the front end of the rocking arm C², which carries the reproducer, is detachably secured an arm G, which extends transversely

across the frame F; the frame F, is slotted longitudinally, the screw shanks of the movable stops F', pass through this slot and have tightening screws underneath. Against one of these stops the arm G, strikes as it is carried in one direction by the lead screw B', and against the other one when carried in the opposite direction by the retracting screw E; the frame F, is carried a short distance by the arm G, as it strikes either stop, and by this means the frame C, is automatically coupled to the lead screw and disconnected from the retracting screw when the frame is carried to the left by the arm G, and automatically coupled to the retracting screw and disconnected from the lead screw when the frame F, is carried to the right. This coupling is accomplished by the depression of the free end of the frame in one case and the elevation of it in the other. It is understood of course that the elevation of the frame disconnects the reproducer from the phonogram, and its depression connects the reproducer and phonogram.

The free end of the frame F, is supported in its lower position upon the upper end of the upright d^3 , and in its upper position upon the upper end of the bar H, which is pivoted upon the front edge of the upright d^3 , a foot f^4 , projects down from the frame F, to rest upon the top of the pivoted bar H. In the lower position the rocking frame C, C', C², is uncoupled from the retracting screw and coupled to the lead screw, the reproducer is also in contact with the phonogram. In the upper position the rocking frame is coupled to the retracting screw and uncoupled from the lead screw and phonogram. The arm H, is drawn and held in its vertical position by a coiled spring h , which pulls it against a stop h' .

Upon the reduced right hand end of the screw shaft E, is secured a disk e^4 , and loosely fitted upon this reduced end is a cam I, in proximity to the disk, a pin e^5 projects inward from the side of disk e^4 , and a similar pin i , projects from the adjacent side of the cam, both pins are arranged the same distance from the axis of the screw shaft E so that when the cam is pushed in the direction of the disk it is revolved with the disk by the pin e^5 , striking the pin i . Depending down from the end of the frame D along side of the cam I, is a rigid arm d^6 , which has an offset above the lowest part of the cam when the frame F, is in its lowest position.

Pivoted to one side of the arm G, is a jay, J, which extends down below the retracting screw E, and has a hooked arm to pass under the screw, the upper side of this arm is curved and spirally inclined to engage the screw threads and couple the arm G, to the retracting screw E, when the frame F, is thrown to the upper position. The upper horizontal arm j , of the jay is a spring and is perforated to pass over a pin j' , which projects from the arm G. The purpose of this arrangement is to hold the jay firmly in place

and to permit it to be thrown from under the screw when it is desired to raise the rocking frame C², and arm G, which may be done by drawing out the spring arm j , until it is disconnected from the pin j' , when the jay may be swung around upon its pivot j^2 .

In the position shown in Figs. 2 and 3 the frame F, is depressed, the jay J, disconnected from the retracting screw the arm C', coupled to the lead screw and the reproducer bearing upon the phonogram. The machine is thus in the position it occupies when reproducing the piece upon the phonogram. Now as the spectacle frame C², with arm G, connected to it moves to the right, the arm G, will strike the stop F', and carry the frame F, to the right until the arm d^6 , strikes the cam I, and carries it in the direction of the disk e^4 , by the same movement of the frame F, the upper end of the pivoted bar H, is pressed to the right by the foot f^4 . Now as the disk revolves the cam I, under the offset of the arm d^6 , the free end of the frame is elevated, disconnecting the arm C, from the lead screw and coupling the jay with the retracting screw, so soon as the foot f^4 , is elevated above the top of the bar H, the spring h , draws it back to its vertical position under the foot f^4 , the frame F, is thus held in its upright position until it is moved in the opposite direction which is done by the arm G, carrying it to the left, a sufficient distance to pull the foot off of the bar H, when the frame again drops to the position shown in Figs. 2 and 3. At the same time a spring i' , which is coiled around the shaft E, between the cam I, and the disk e^4 , presses the cam away and disconnects the pins e^5 , and i .

I will now describe the means by which the machine is automatically set in motion, and automatically stopped: From the frame F, a leg f^5 , extends downwardly opposite the standard d^4 , which projects up from the base D, a contact spring L, is secured to one side of this leg, but insulated from it by the plate of fiber l , or other insulating material. The spring extends around the under side of this leg and is inclined upwardly and outwardly from it. In the upper slotted end of the standard d^4 , is journaled a lever M, upon the inner end of which is formed a bar m , which overbalances the long arm m' , of the lever, which carries and holds the bar m , against the standard d^4 , and out of contact with the spring L. The long arm of the lever M, is slotted to receive but not pass a coin, which is dropped into a chute N, the outer end of which extends through the case or cabinet and the inner end of which terminates above and registers with the slot in the lever arm so that when the coin is dropped into the chute it will fall into the slot in the arm m' , depress the lever, and bring its inner end in contact with the spring L, thus closing the circuit through the frame of the attachment. The electric wire 1, connects to the spring L, and the wire 2, connects to the upright d' , the pin f^6 , projects out from

the leg f^5 , to stop the lever in nearly a horizontal position until the frame F, is moved to the left a sufficient distance to draw the pin from over the bar m , of the lever when the weight of the coin throws the long end of the lever down the coin will roll off into a receptacle in the cabinet, when the lever will be returned to its normal position to receive another coin. The movement of the frame to the left also draws the foot f^4 , off from the top of the pivoted bar H, when the free end of the frame drops down and brings the base of the spring L, upon a spring O. This again closes the circuit which remains closed until the arm G, is carried to the right a sufficient distance to engage the stop F' , and carry the frame along with it until the cam I, engages with the leg and elevates the frame F, and breaks the circuit: The contact surfaces are preferably tipped with platinum to prevent injury from "sparking" when contact is made or broken. From the foregoing it will be seen that so soon as the piece upon the phonogram has been given off the frame F, is elevated, the circuit broken, causing the mechanism to stop, the spectacle frame C^2 , uncoupled from the lead screw and coupled to the retracting screw, ready to be returned, and the piece again given off by the introduction of another coin into the chute. The stops F' , F' , are set to correspond to the length of the piece upon the phonogram. To prevent jar when the frame F, is carried to the left by the arm G, I interpose a coiled spring f^7 , around the pin d^5 , between the arm f , and the upright d^2 .

I do not limit myself to the exact construction and arrangement of the parts shown that it is evident that many mere mechanical changes may be made to accomplish the same result. I would therefore have it understood that I shall consider such mere mechanical changes as within the spirit and scope of my invention.

What I claim is—

1. The combination, with a phonograph having a sliding and rocking carriage with an arm carrying a reproducer and an arm adapted to be engaged with the lead screw when the carriage is depressed, and disconnected from it when the carriage is elevated, of a standard or frame, a carriage retracting screw mounted in said standard, a vibrating frame also mounted in said standard, an arm secured to and extending from the reproducer carriage or spectacle frame over said vibrating frame to be actuated by the vibrating frame, a jay secured to said arm to engage the retracting screw when the arm is elevated, and to be released from it by the depression of the arm, stops secured upon said vibrating frame in the path of the extended arm by which the vibrating frame is moved longitudinally, a support to hold the vibrating frame in its elevated position, a cam actuated by the retracting screw to elevate the vibrating frame upon said support, electrical contacts upon the vibrating frame and the standard, a pivoted le-

ver adapted to receive a coin, and be actuated by said coin to close the circuit and set the phonograph in motion, and the electric wire, one connected to the standard and the other to the vibrating frame and passing thence to the motor whereby the motor is set in motion to retract the carriage, the carriage depressed and carried forward by the lead screw, elevated, the circuit broken, the machine stopped, and again brought into position to be set in motion by an inserted coin, substantially as shown and described.

2. In a phonograph attachment the combination of the standard, the retracting screw and vibrating frame mounted thereon, the arm G, resting upon the vibrating frame and secured to the rocking frame of the phonograph, supports for the vibrating frame in its upper and lower position, means such as shown to elevate the vibrating frame upon its upper support and to throw it therefrom, an open circuit through said support and standard to the phonograph motor when the vibrating frame is elevated, a coin actuated lever to close the circuit and set the machine in motion and return it to its normal position when the coin is discharged substantially as shown and described.

3. In an automatic coin actuated attachment for phonographs the combination substantially as hereinbefore set forth of the frame or standard D, d , d' , d^2 , d^3 , d^4 , the retracting screw E, and vibrating sliding frame F, mounted in said standard, the extension arm G, resting upon said frame, the stops in F' , in said frame in the path of said arm, the coupling jay J, secured to said arm the downwardly extending leg f^5 , the contact spring L, carried by said leg, the electric wire 1 connecting said spring and the motor battery, the pivoted lever M, for closing the circuit through said spring, the electric wire 2, connecting the battery and standard D, the spring contact O, connected to the standard and means such as shown for elevating and depressing the frame F, coupling and uncoupling the lead screw, and retracting screw, automatically by the introduction of a coin.

4. The combination of the standard D, and its connections the electric wire 2, connected to said standard, the vibrating and sliding frame F, carrying the insulated contact spring L, the wire 1, connected to said spring, and the coin actuated lever M, for closing the circuit through the frame and setting the machine in motion, substantially as shown and described.

5. The combination in a phonograph attachment of the vibrating frame for connecting and disconnecting the reproducer from the phonogram, of the lead screw for carrying the frame and reproducer over the phonogram, the retracting screw, arm G, and jay, J, for returning the frame and reproducer when disconnected from the phonogram and lead screw the cam I, and disk e^4 , actuated by the retracting screw to disconnect the frame from

the phonogram and lead screw and couple it to the retracting screw, the supports for the said frame in its upper and lower positions, the electric contact pieces L, O, and coin actuated contact lever M, for closing the circuit and setting the machine in motion.

6. In a phonograph of the character described the combination of the vibrating frame and retracting screw located in front thereof, the arm G, secured to the spectacle frame of the phonograph and extending over the vibrating frame, the coupling jay secured to said arm and having its hooked end extending under the retracting screw to engage said screw when the vibrating frame is elevated and be disengaged from it when the frame is depressed, the stops F' , F' , to be engaged by the arm G, and move the frame in either direction the contact spring L, connected to the frame the lever M, having the weight or bar m , to hold it normally out of contact with said spring, and slotted arm m' , to deliver an inserted coin in the slot in the arm, the contact spring O, connected to the frame D, of the attachment under the spring L, and the electric wires connecting the vibrating frame and frame D, and the phonograph motor whereby the machine is automatically set in motion by the insertion of a coin and automatically stopped and reset for the reception of another coin after the piece on the phonogram has been reproduced substantially as hereinbefore set forth.

7. In an automatic coin actuated attachment for phonographs the means hereinbefore described for making and breaking the electric

circuit, which consists of the vibrating frame F, carrying the terminal L, the standard D, carrying the terminal O, the lever, M, m , m' , for closing the circuit through the attachment when the frame is in its elevated position, the chute for delivering the coin on said lever, the said terminals L, and O, arranged one above the other and adapted to be brought in contact by the depression of the frame, combined and arranged substantially as shown and described.

8. The combination in a phonograph attachment of the standard, lead screw, and vibrating frame mounted therein, the spectacle frame, the extension arm G, secured thereon and extending over the vibrating frame; jay J, pivoted upon said arm G, and adapted to be held rigid for the connection with the screw E, or to be swung around on its pivot to escape said screw and permit the spectacle frame and arm G, to be thrown up substantially as shown and described.

9. The combination substantially as hereinbefore set forth of the standard having up-rights d' , d^2 , and pins d^3 , projecting from said standards, the vibrating frame F, swung upon said pins, the weighted lever, f' , f^3 , pivoted on standard d^2 , having its unweighted end bearing against the under side of the frame F, to counterpoise it substantially as shown and described.

MARCUS O. ANTHONY.

Witnesses:

FRANK L. DAVIS,
GEO. J. MURRAY.

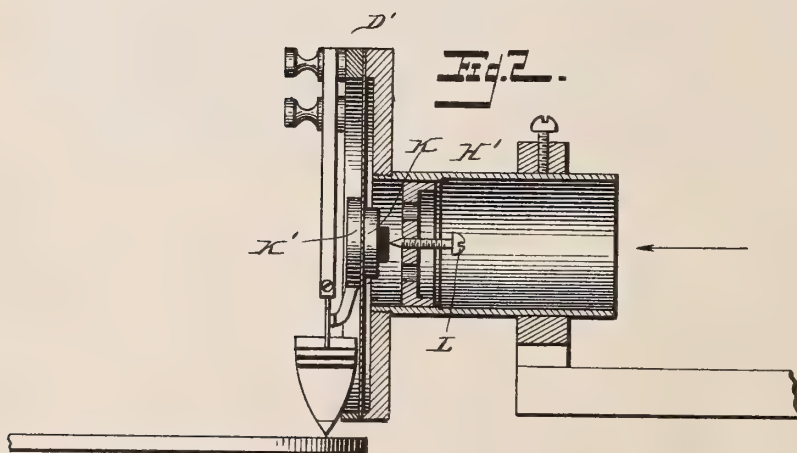
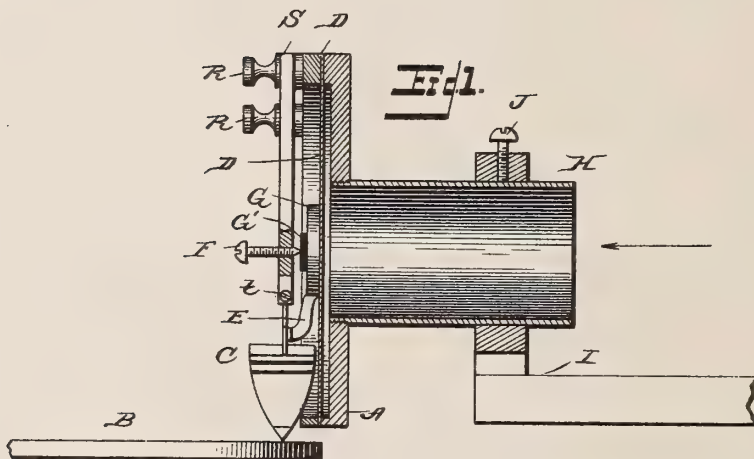
(No Model.)

2 Sheets—Sheet 1.

E. L. WILSON.
SOUND RECORDING INSTRUMENT.

No. 489,666.

Patented Jan. 10, 1893.



Witnesses.

J. M. Fowler Jr.
R. T. Heck.

Inventor
Edward L. Wilson
M. Doolittle
By Attorney.

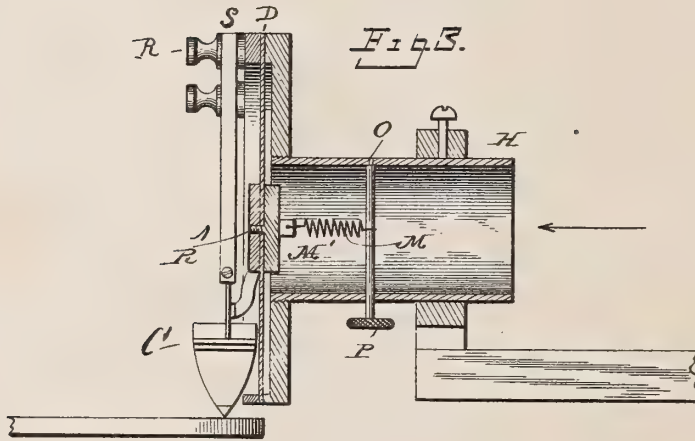
(No Model.)

2 Sheets—Sheet 2.

E. L. WILSON.
SOUND RECORDING INSTRUMENT.

No. 489,666.

Patented Jan. 10, 1893.



witnesses:
R. F. Heck
J. N. Blackwood,

Inventor:
Edward L. Wilson
By *Wm. H. Doolittle*
Attorneys

UNITED STATES PATENT OFFICE.

EDWARD L. WILSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

SOUND-RECORDING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 489,666, dated January 10, 1893.

Application filed August 11, 1892. Serial No. 442,836. (No model.)

To all whom it may concern:

Be it known that I, EDWARD L. WILSON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Sound-Recording Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in gramophones and similar sound recording instruments, and it has for its object to give to the diaphragm greater flexibility, while maintaining a proper tension, whereby louder and more distinct articulations of spoken language and better results in the recording of musical notes, are produced, which better results of course will follow in the reproduction of the same sounds. In such instruments, in which the record surface of a metal plate is impressed by a stylus attached to a transmitting vibratory diaphragm it is necessary to employ what is known as a damper to give to the diaphragm a certain amount of pressure to produce such a tension of the same as will properly receive the sound vibrations, and at the same time maintain its flexibility. But if this tension is too great the flexibility is impaired or destroyed and the sounds indistinctly recorded.

My invention is illustrated in the accompanying drawings in which

Figure 1 is a side view in elevation partly in section, and Fig. 3 is a similar view of a modification. Fig. 2 is a similar view of apparatus now in use and is given to illustrate the difficulties my invention is designed to obviate.

Referring to Fig. 1, A is the frame of a sounding box composed of a circular disk and ring, between which, at the rim, a diaphragm D is rigidly secured.

C is a stylus hinged on a rod, or otherwise pivoted, at the point *t*, on a supporting frame, and adapted to operate on the record plate B. The support S is attached by screws R to the rim of the sounding box.

H is a sound receiving tube secured to a support I by a screw, J, and provided with a screw thread on one end by which it is screwed into the box A, so that the inner end

of the tube is opposite the center of the diaphragm.

G is a circular piece of hard rubber secured to the center of the diaphragm and provided with a finger E, of the same material, adapted to contact with the shank of the stylus.

G' is a piece of soft rubber secured to the center of the rubber piece G.

F is a damper, consisting of a screw, which is inserted from the outside of the sounding box and diaphragm, through the support S, and directly against the center of the soft rubber piece G'. Preferably the dampers should be applied at the center as here described, but some variation may be made in this respect without departing from my invention.

In some instances the stylus has been used as a damper, but not with good results, when thus used both as a stylus and sound recorder, but by my method it will be noticed that the damper and stylus are arranged independent of each other, so that each is permitted to do its own work independently. It will also be noticed in this form of my invention that as the damper is outside of the diaphragm the latter is forced against the sound waves.

In one known method, illustrated in Fig. 2, the damper, L, is mounted in the tube H' and is forced against the rubber bearings K, rigidly secured to the diaphragm D'. The diaphragm is also held between the inside rubber bearing K and the outside hard rubber bearing K' secured on the opposite side of the diaphragm, and carrying the finger connected with stylus. By this method the diaphragm is rendered more inflexible, as the pressure of the sounds against the diaphragm is added to by the pressure of the damper in the same direction. The tension thus produced on the diaphragm is too great to produce the best results.

In Fig. 3 I have illustrated a modification of the principle of my invention which is to force the diaphragm, by the damper tension, in the direction from which the sound proceeds. In this modification the damper consists of a spring, M, secured in the tube H, on a rod, O, which is adapted to be turned, so as to regulate the tension of the spring by the thumb nut, P. The opposite end of the spring is secured to the double rubber bearing R, on

the diaphragm, and the outside portion of which is provided with the finger connecting with the stylus. In addition to the advantage mentioned of forcing the diaphragm against the sound there is a great advantage in the convenience of manipulating the damper by having access to it outside of the sound receiving tube, as shown by my improvements in Figs. 1 and 3, and comparing them with the arrangement shown in Fig. 2. By this easier access to it the damper can also be better adjusted to give greater steadiness and support to the diaphragm, especially when the damper is to be placed and operated at any point on the outside of the sound receiving tube.

It will be noticed that my invention is applicable to other instruments in which it is desirable to regulate the tension of a sound receiving diaphragm.

Having thus described my invention what I claim is:—

1. The combination with a sound receiving tube of a diaphragm and a damper, said damper arranged outside of said tube and adjusted to bear directly on or near the center

of said diaphragm, substantially as and for the purpose described.

2. In a sound recording instrument the combination with the stylus, of a record plate, a damper and a diaphragm, said damper arranged to operate on or near the center of the diaphragm, and on the outside thereof, and the stylus and damper arranged to work independently of the other, substantially as described.

3. In a sound recording instrument the combination with a sound receiving tube, of a transmitting vibratory diaphragm and stylus, a rubber pad secured to the center of said diaphragm and provided with a finger to connect with said stylus, and a damper located outside of said tube and diaphragm and adapted to be forced against said pad, substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

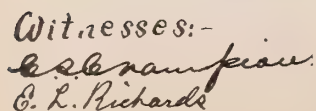
EDWD. L. WILSON.

Witnesses:

JOS. H. BLACKWOOD,
ROY. F. HECK.

W. L. MADGEN.
COIN FREED MACHINE.

Patented Jan. 24, 1893.



Inventor: -
William Leonard Madge.
by Richard R.
Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM LEONARD MADGEN, OF LONDON, ENGLAND.

COIN-FREED MACHINE.

SPECIFICATION forming part of Letters Patent No. 490,450, dated January 24, 1893.

Application filed April 10, 1890. Serial No. 347,407. (No model.) Patented in England December 7, 1888, No. 17,937.

To all whom it may concern:

Be it known that I, WILLIAM LEONARD MADGEN, residing at London, England, have invented an Improvement in Coin-Freed Machines for Reproducing Sound and Advertising by the Same, (for which I have obtained Letters Patent in Great Britain under No. 17,937, dated December 7, 1888,) of which the following is a specification.

My invention relates to coin-feed automatic machines such as those used for selling matches, sweetmeats, photographs and such articles, and has for its object the arrangement and construction of mechanism alone or in combination with such machines so that they shall give forth sounds, such as songs by celebrated singers, or sentences advertising people's goods upon the insertion of a coin, or token into the machine, either for the purpose of obtaining a box of matches or sweets or other goods or for hearing the re-production of a song by a celebrated artist, or of a combined effect of the re-production of sound accompanying the automatic delivery of goods.

I wish it to be distinctly understood that there are many methods by which my invention may be carried into effect without departing from the essence of the same, but in order that it may be the better understood I will now proceed to describe one form of machine in relation to the drawings hereunto annexed, reference being had to the letters marked thereon.

Like letters and numerals refer to like parts throughout the figures.

Figure 1 is an end sectional elevation of one form of my apparatus. Fig. 2 is a side elevation with the coin directing chutes and the casing in section, one side being arranged for hand operation, the other side by an electro-motor. Fig. 3 is a plan of Fig. 2. Fig. 4 is a side view of the retaining catch for locking the machine when mechanically worked by hand. Fig. 5 is a view of the ear tubes which may be conveniently used to hear the reproduction of the phonograph record. Fig. 6 shows a simple method of supporting the impression cylinders so that they may be easily changed. Fig. 7 is a sectional view of the coin carrying frame or receptacle on the diaphragm lever. Fig. 8 is an outside view of

an automatic match-box machine with my apparatus attached thereto.

To carry out my invention I mount a cylinder, or other block A, upon which the sound vibrations are registered in such a manner that it may be suitably driven by clock work, electric, manual, or pedal power so that upon a coin, or token being dropped into the receiving slot the clock work or other mechanism is released, or the circuit of an electric motor is completed, and the mechanism is accordingly operated. I may cause either the phonograph cylinder to move longitudinally, relatively to the diaphragm or equivalent by the diaphragm to the cylinder.

In Figs. 1, 2 and 3 I show the diaphragm B adapted to move longitudinally along the phonographic cylinder. This diaphragm is mounted upon a lever C, pivoted upon a rod D, supported in the side frames. At one extremity of the lever C, a receptacle E, for holding a coin is attached, a hole being provided in the bottom of this receptacle E, which will allow of a half penny passing through, but which is small enough to retain a penny. Upon the opposite end of the lever C, a counter balance weight F, is arranged, which, when the lever C, is not depressed by the weight of the coin, raises the diaphragm B, away from the periphery of the cylinder A. Upon each side of the parallel rod D, I arrange two screws G, G', having threads of the same hand. These screws are geared together by cog wheels H, and H'. Upon the opposite end of the screw G, I arrange another cog wheel I, which gears into the cog wheel K, upon the cylinder A.

I have shown in Figs. 2 and 3 alternative methods of driving the mechanism, the right hand phonograph being adapted to move by hand through a crank lever and friction clutch, and the left hand by an electro-motor. In the first case the friction clutch is attached to a spindle G¹¹, and in the second case a pulley L is attached to the spindle G¹² and conveniently connected to the electro-motor M' by means of a strap.

The coin receptacle E, is so made that when the coin drops from the slot it shall rest within the receptacle as shown in Fig. 7, and as the lever B, nears the end of its travel along the cylinder A the projection N comes in con-

tact with the coin, and pushes it from the receptacle into a box, or into another receptacle or passage which shall convey it to the coin freeing mechanism, match box, or other apparatus as the case may be.

Fig. 4 shows a view of the catch O arranged for retaining the mechanism in the hand driven machine illustrated on the right hand side of Figs. 2 and 3. This catch is pivoted upon a support on the frame casing and is maintained in the position shown in Fig. 4 by a counter-balance weight O' resting on a small stop *o*. The lever C is shown in section in its lower and upper position, the upper one being dotted. When the lever C has reached the extreme end of the phonographic cylinder and the projection N has pushed out the coin from its receptacle E the counter-balance weight F lowers the hand lever C from the dotted position to that shown in full, when then the lever C at the end of its travel comes in contact with the catch O its upper end is depressed and the counter-balance weight lifted allowing the passage of the lever C which latter when passed allows the catch O to drop down into the position shown in Fig. 4 similar in connection to the ordinary latch of the door.

The edge wall of the coin slide, is recessed to receive the shutter P, which passes in between the side walls of the slide as shown in Fig. 1, this shutter having a right angled extension as at Q, serving as a pivot and passing through the side wall A' of the coin slide. This shutter has a weight *q*, shown in Fig. 2, which tends to keep the shutter normally intercepting the coin passage, but the shutter is moved out of the passage by a projection *q*, on the end of the lever C, coming in contact with the arm *p* projecting from the pivot of the shutter.

Fig. 5 shows a usual form of ear tubes which may be suitably arranged on the machine in order to convey more perfectly to a person listening any sound that may result from the working of such phonograph.

I may arrange two or more record cylinders within the same machine for example having records of songs by various singers as shown in Figs. 1, 2 and 3. The coins are directed to the respective cylinders on one side or the other of the receptacle by the arm R pivoted at the apex of the two slides, with its end projecting into the space leading to both, and this arm may be operated by a handle on the outside.

In order to easily replace or substitute the phonographic cylinders in the machine for others I mount them upon spring-pressed centers *s s* thus affording great facility in the manipulation of replacing the same.

Fig. 8 shows the ordinary form of a coin-freed match-box machine having my phonograph fixed at T, the handle M and the listening orifice S being shown. The coin after leaving the coin-receptacle E, may as usual

in many such machines, operate a second device, such as a match-holder or the like.

The operation of my mechanism is as follows.—The coin being inserted through the slot A', falls into the receptacle E and depresses the coin end of the lever C against the counter balancing action of the weight F causing the diaphragm B to rest upon the periphery of the cylinder A at the same time causing the half nut *b*, to engage itself with the screw G' and at the same time disengaging by lifting from the catch O which will make a closed electric circuit or release a clockwork escape, or when the machinery is hand driven will enable the lever *c*, Fig. 4, by being raised to pass over the retaining point of the catch O so that upon the revolution of the apparatus either by the handle M and spring clutch *m* or by electric, or or other motive power through the pulley L, the cylinder A, will be revolved, and the diaphragm lever C, will be moved along its length. Upon the receptacle E nearing the end of its stroke it comes in contact with the projection N, the end of such projection gradually forces the coin from the receptacle E until it falls into any suitable box or coin slot of the match box or similar coin freeing mechanism. Directly the coin has left the receptacle E the weight F throws the lever round about its center D. so as to remove the diaphragm B away from the cylinder surface and disengages the half nut *b* from its screw G and engages the other half nut *b'*, with its screw G'. so that by the continued revolution of the mechanism the diaphragm lever C is brought back, until its end F depresses the upper part pivoted catch O raising the lower part which breaks the electric motor circuit indicated by 4^a, Fig. 2 or locks the escapement movement of a clock work motor or when rotated by hand engages behind the lever C. directly it has passed the same and come home on the buffer *t* and prevents the further operation of the motive mechanism or machine until the lever has been again depressed by the insertion of another coin.

What I claim as my invention and desire to secure by Letters Patent is.—

1. In combination with a rotating impression cylinder, a counterbalanced pivoted lever, a vibrating diaphragm carried thereby, a coin receptacle also carried by said lever, the said lever and the impression cylinder being adapted to move longitudinally, with respect to one another, substantially as described.

2. In combination with a rotating impression cylinder, a counterbalanced pivoted lever, a vibrating diaphragm carried thereby, a coin receptacle also carried by said lever, means for moving the lever back and forth, and a pivoted retaining catch O, substantially as described.

3. In combination with a rotating impression cylinder, a weighted pivoted lever, a vi-

brating diaphragm carried thereby, a coin receptacle also carried by said lever, means for moving said lever longitudinally of the cylinder, a coin slide, a shutter P for obstructing the said coin slide, said shutter being operated by the end of the pivoted lever, substantially as described.

4. In combination with a rotating impression cylinder, a weighted pivoted lever, a vibrating diaphragm carried thereby, a coin receptacle also carried by said lever and parallel screws driven from a source of power, and engaging said pivoted lever to move it back and forth, substantially as described.

5. In combination with a rotating impres-

sion cylinder, driven from a source of power, parallel screws driven by gear connections with the cylinder shaft and each other, a weighted lever pivoted between the screws and driven therefrom, a diaphragm carried by said lever, a coin receptacle also carried thereby, and a catch O, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM LEONARD MADGEN.

Witnesses:

RICHARD A. HOFFMANN,
FRANCIS W. CATFORD.

(No Model.)

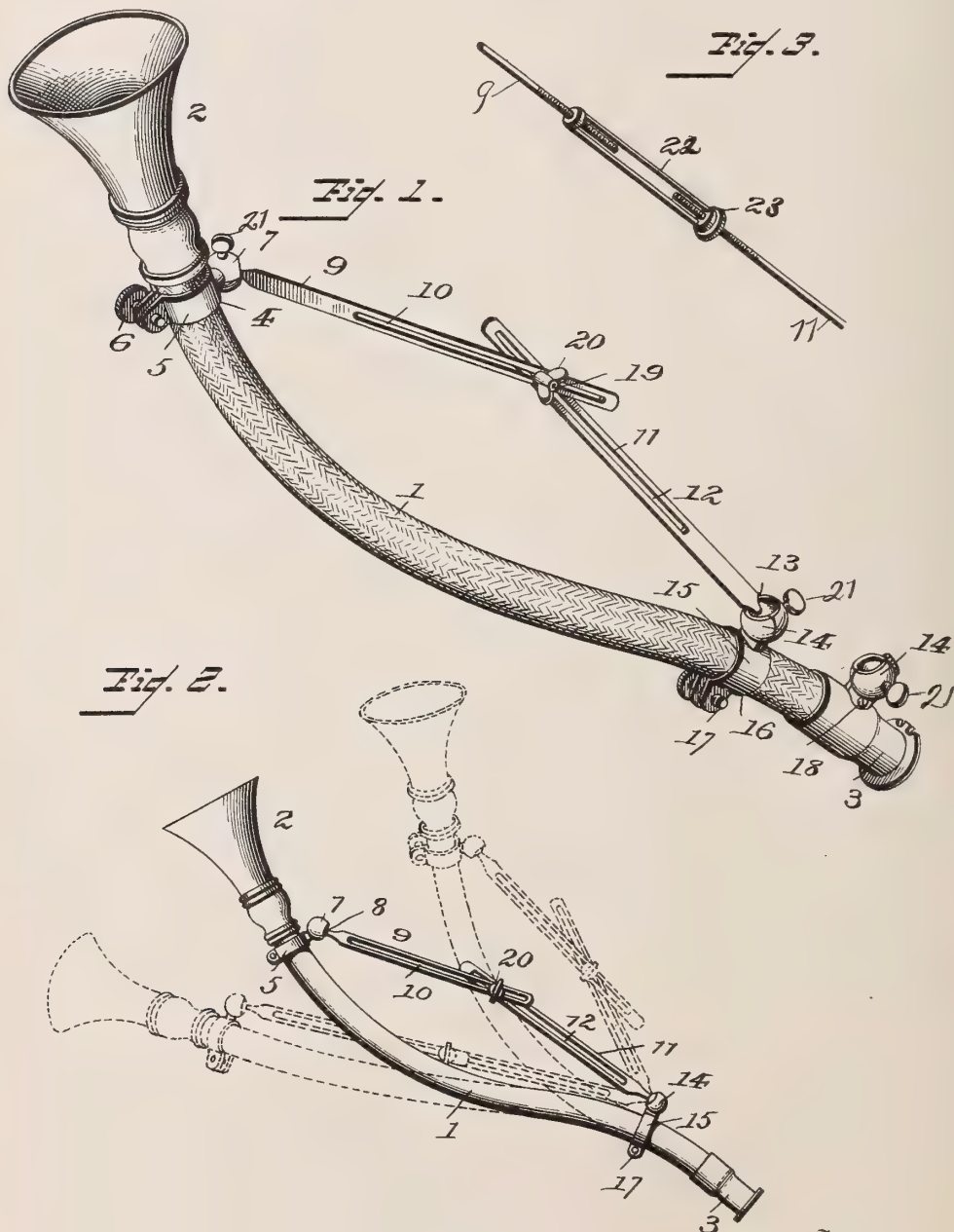
2 Sheets—Sheet 1.

W. G. HENDERSON.

SUPPORT FOR PHONOGRAPH SPEAKING TUBES OR OTHER PURPOSES.

No. 493,719.

Patented Mar. 21, 1893.



Witnesses

J. A. Rutherford.
Robert Everett.

Inventor

William G. Henderson.

By

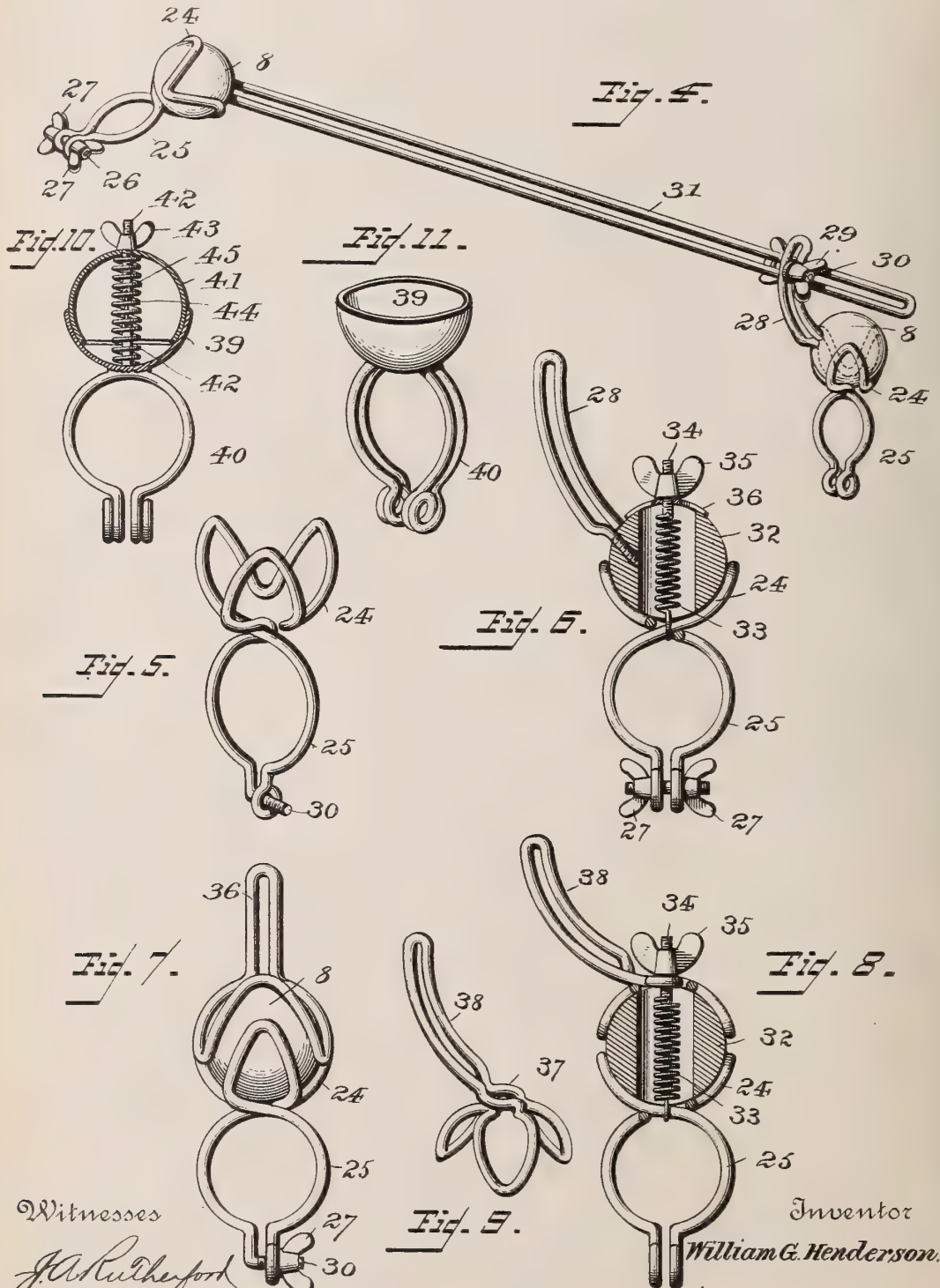
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SUPPORT FOR PHONOGRAPH SPEAKING TUBES OR OTHER PURPOSES.

No. 493,719.

Patented Mar. 21, 1893.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM G. HENDERSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

SUPPORT FOR PHONOGRAPH SPEAKING-TUBES OR OTHER PURPOSES.

SPECIFICATION forming part of Letters Patent No. 493,719, dated March 21, 1893.

Application filed March 12, 1892. Serial No. 424,696. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. HENDERSON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Supports for Phonograph Speaking-Tubes or other Purposes, of which the following is a specification.

My invention relates to devices for sustaining speaking or sound transmitting tubes and is especially well adapted for the speaking tubes used in connection with the phonograph, graphophone and kindred machines. Heretofore it has been the practice to hold the speaking tube with one hand while dictating to the machine. This very often is very inconvenient, and allows the operator the use of only one hand for handling papers or for other uses. It is very desirable often that the operator may have the use of both hands, and it is with the foregoing difficulties in mind that this invention has been devised to remove them and to give to the operator the freedom of both hands while dictating to the machine, and also to avoid the necessity of picking up the tube when the dictation is to be made and to lay it down when the dictation is to be suspended.

To the accomplishment of the foregoing objects the invention consists in providing for the tube a support which will sustain it independent of the hands as herein described. There may be many modifications of the support but the form preferred is one which will not only sustain the tube but also permit it to be adjusted up or down to different angles, and also that will permit it to be turned laterally or sidewise, so that it may be brought into the position that will be most convenient for the operator under the conditions or circumstances that may exist at the time.

One or more constructions that will serve the purpose in view will now be particularly described reference being had to the accompanying drawings forming part hereof and in which

Figure 1 is a perspective of a phonograph speaking tube with my invention applied thereto. Fig. 2 is a similar view on a smaller scale, and in which is also shown by dotted lines two of the many positions to which the tube can be adjusted. Fig. 3 is a modified

form of the device. Fig. 4 is another form in which the operative parts are formed of wire with the ball of any suitable material. Fig. 5 is a perspective of one form of socket and tube band, being the same as the corresponding parts shown in Fig. 4 but on a larger scale. Fig. 6 is another form in which a simple socket is used with a contractile spring for regulating the frictional contact between the ball and socket and for taking up wear, and which also serves to hold the ball to the socket if the ends of the socket fingers are made to terminate below the medial line through the ball. Fig. 7 is another form showing two cups or sockets the points of the fingers of both being made to cross the medial line of the ball. Fig. 8 is another form showing two cups or sockets with the points of the fingers terminating short of the medial line of the socket, and a spring employed for holding the ball and socket together. Fig. 9 is a perspective of the upper socket of Fig. 8 with the extending arm thereon. Fig. 10 is a side elevation of another form with the ball in section and formed of two semi-spherical shells held together by a connecting pin and containing an expansion spring for forcing the sections from each other and making frictional contact between them. Fig. 11 is a perspective of the lower part of Fig. 10 showing the lower shell in full lines.

In the drawings the numeral 1 designates the speaking tube of the flexible form in common use and having the usual mouth piece and coupling by which it is attached to the diaphragm of the machine not shown. Near the mouth-piece 2 a clamp 4 of any desirable form is made to clasp the tube. It is illustrated in this instance in Fig. 1 as composed of the band 5 having a tightening screw 6 passed through its free ends so that it may be adjusted to the diameter of the tube and made to clasp the same. This clamp is also shown as formed with a socket 7 in which fits the ball 8 whereby is formed a universal joint of the ball and socket order so that the tube at that point can be adjusted within all the limits allowed by a universal joint about a rod or arm 9 extending therefrom. While such mode of connecting the tube and rod together is preferred it is not meant to be restricted thereto.

The rod or arm 9 may be of any desired construction but for purposes of illustration is represented in Fig. 1 as composed of a flattened bar formed with an elongated slot 10, and is shown as adjustably connected to another similarly formed rod or arm 11, having an elongated slot 12 and provided at its end with a ball 13 fitting into a socket 14 formed upon the band 15 of the clamp 16 which is shown as encircling the tube 1 and held thereto by a screw 17 passed through the free ends of the band. All that has been stated in regard to the clamp 4 and its connections applies to the clamp 16 and its connections. It may here also be stated that if desired the clamp 16 may be omitted entirely, and the socket 14 be formed upon the coupling 3 as indicated in Fig. 1, in which event the ball end of the rod or arm 11 would fit into the socket and operate the same as if the clamp 16 were used. The socket may as indicated in Fig. 1 be made of two parts hinged together so as to be swung open in inserting the ball and when closed be held by a screw fastening 18, or otherwise.

The two rods or arms 9 and 11 may be regarded as constituting one arm in two parts connected together by suitable means and constructed so as to permit an adjustment of the tube.

The means illustrated in Fig. 1 for connecting the two sections 9 and 11 together consists of a well known form of threaded bolt 19 passed through the slots in the two sections and provided with a thumb nut 20 for holding the sections together, and by loosening which the sections can be shifted to raise the tube as shown by dotted lines in Fig. 2, or to lower the tube as shown by the lower dotted lines in the same figure, or to such other adjustment as may be desired. When the adjustment has been effected the arms or sections will be held to their shifted position by simply tightening the nut on the bolt 19.

It will be apparent from the foregoing statement that the tube can be brought into the position required to suit the convenience of the operator whether high or low, and that it can also be turned laterally or sidewise as the position of the operator relatively to the table or machine may make it desirable, the universal joint permitting such movement.

If desired set screws 21 may be passed through the sockets and be made to bear against the balls so as to firmly hold the parts in the position in which the tube may be placed. These, however, are not essential to the invention. The sockets may be made in any well known way. In one place they are illustrated as made of two parts hinged together, but they may be made in two parts with threaded shanks screwed into the clamping bands so that when screwed into place they will be held together.

The description given sets forth one construction that will accomplish the objects in view, but as stated in the beginning there

may be many modified forms of the invention to accomplish the same objects or some of them and which would be embraced within the scope of the invention; and in Fig. 3 of the drawings I have illustrated one modification of the supporting arm and of the means for lengthening and shortening the arm. In this modification the sections or arms 10 and 11 are composed of light steel rods having their adjacent ends threaded, one having a right and the other having a left thread, and held together by a turn-buckle 22 provided at one end with a milled head 23 by which the buckle can be turned so as to draw together or separate the sections and thus effect the shifting of the sections for the adjustment of the tube. This modification, however, may not admit of the same extent of movement as the first form but still it will serve to support the tube and allow it to be adjusted up and down, while the ball and socket joints with which the rods will be provided at the clamps as in the first form will allow the lateral adjustment of the tube.

The two constructions shown and described are sufficient for an illustration of the invention in a practical form, but it is obvious that the modifications may be greatly multiplied. For instance, in Fig. 4, I have illustrated the socket 24 of the ball 8 as made of wire bent into the shape of finger clasping the ball with their outer ends passing the medial line of the ball so as to hold the ball in its socket. The wire may have sufficient elasticity to yield to the ball when pressed into its socket and then close around the ball or it may be pressed down upon the ball after the ball is set into the socket; and the friction between the ball and socket may be sufficient to hold the ball at any position to which it may be moved. In the same figure the wire forming the socket is also, represented as bent to form the band 25 which will encircle the tube to clamp the socket to it, and eyes are formed by turning the wire at its ends, and through the eyes will be passed a threaded bolt 26 provided with thumb-nuts 27 for securing the band around the tube. The ball, socket and band at the two ends of the tube may be duplicates of each other and therefore the same reference figures will apply and be used for both. But the ball next to the end of the tube that couples to the phonograph carriage will be provided with a short arm 28 preferably made of wire and secured in any suitable manner to the ball and preferably curved upward as illustrated. This arm will correspond to the arm 11 of Fig. 1 and will have secured to it by thumb-nuts 29 and bolt 30, or otherwise, the lower end of the arm 31 preferably formed of wire bent into the shape shown and secured at one end to the ball at the other end of the tube, which arm corresponds to the arm 9 of Fig. 1. By loosening the thumb-nuts 29, one rod can be adjusted upon the other so as to raise or lower the tube to the adjustment desired as described in connection with Fig. 1.

Another form is illustrated in Fig. 5 in which the lower socket 24 and its band 25 are the same as in Fig. 4 but one end of the band wire is turned as shown to form the threaded 5 bolt 30 which will pass through the eye in the opposite end of the band.

Another form is illustrated in Fig. 6 in which the lower socket and its band will be formed as in Fig. 4 but in this form the ball 32 10 is formed hollow or with an opening through it for the reception of a spring 33 which is preferably of the spiral order and which is secured at its lower end to the socket and provided at its upper end with a threaded portion 34 on which is screwed a thumb-nut 35, 15 the same bearing against a washer 36 which is preferably made to conform to the shape of the ball. By the construction just described the friction between the ball and its socket 20 may be regulated at will by adjusting the nut, and in the same manner any wear may be taken up. Furthermore, under this form, the points of the fingers need not pass the medial line of the ball as the ball can be held to its 25 socket by the contractile power of the spring, the tension of which will be regulated by the adjustment of the nut. In this form the arm 28 is shown as having one end bearing against the ball and the other threaded and screwed 30 into the ball.

A still further form is illustrated in Fig. 7 in which the lower socket is formed similar to Fig. 5 and the ball 8 held therein by the upper ends of the fingers extending above the 35 medial line of the ball. There is also used an upper socket formed of wire and in which the arm 36 corresponding to the arm 11 is formed integral with the socket. The lower ends of the fingers to the upper socket pass below the 40 medial line of the socket and play between the fingers of the lower socket. These fingers may have sufficient elasticity to spring over the ball or may be bent down about it after the ball is placed in position. If desired the ball 45 and socket may be caused to fit so close to each other, or otherwise formed so that the frictional contact between them will be sufficient to hold the ball and socket to any position to which they may be adjusted.

Another form is illustrated in Fig. 8 in which the lower socket will be formed like the lower socket in Fig. 6 while the upper socket with its arm corresponding to the arm 11 will be formed as clearly illustrated in 55 perspective Fig. 9. The ends of the fingers to the lower and upper sockets terminate respectively below and above the medial line of the ball 32 which corresponds in structure to what is illustrated in Fig. 6, and the 60 fingers terminating as described permit the fingers to pass each other without interference of one with the other whereby a wider range of adjustment is obtained. A spring 33 corresponding to the spring in Fig. 6 and likewise formed with a threaded portion 34 and nut 35 working thereon is provided for holding the ball and socket together, there being no

washer as in Fig. 6 as the nut will bear against the portion 37 of the socket and the arm 38 will be formed integral with the wire 70 forming the socket.

Another form is illustrated in Figs. 10 and 11 in which the lower socket is formed of a shell 39 of sheet metal or other suitable substance stamped or otherwise formed into 75 hemispherical shape and having brazed to it the wires 40 constituting the band to pass around the tube 1. The upper portion constituting the ball is formed of a hemispherical body 41 fitting into the sockets 39 so as to 80 turn therein. The two hemispheres are held together by means of a flexible jointed pin 42 connected to and extending from the lower hemisphere 39 while its upper end is passed through the hemispherical body 41 and its 85 end threaded for the application of a nut 43. The two hemispheres are thus held together and the pin having a flexible joint between its two ends formed by a link 44, or otherwise, the hemispherical body 41 is free to be 90 moved into any position desired and a universal joint of the ball and socket order is thus formed. An expansible spring 45 encircles the connecting pin 42 and exerts an outward expansive pressure against the two 95 hemispheres and thus tends to force the same apart and hold the spherical surface of one against the other by frictional contact sufficient to hold the upper portion at any point to which it may be adjusted. A bifurcated 100 arm not shown but similar to the arm 28 of Fig. 4, may be brazed to the portion 41 so as to have the arm 31 coupled thereto.

The foregoing are some of the forms in which the device may be made but they may 105 be varied almost indefinitely without departing from the spirit of the invention as is obvious.

The several parts will preferably be of metal and will be made as light as possible 110 consistent with strength and durability, and being graceful and light in proportion will not detract from the appearance of the machine or the tube. The weight too will be so comparatively little that it will not interfere 115 with the perfect and easy working of the machine carriage with which it will be moved just as it is now. This is deemed much preferable to connecting the support to an independent stand, in connection with which, 120 however, some features of the invention might be combined or used.

It will be understood that the invention is not intended to be confined to phonograph speaking tubes where it can be used with 125 good results in other forms of sound transmitters but it is as hereinbefore stated particularly well adapted to phonograph and kindred machines.

It will also be apparent that the invention 130 is capable of very wide application, the forms illustrated in Figs. 4 to 8 admitting of the ball being turned in the socket or the socket turned on the ball to carry an arm extending

therefrom to various angles of adjustment up or down or horizontally.

The same features of construction can be used in a support constituting a telephone holder or an incandescent electric light support, as well as in other kinds of supports. For instance, of the two arms or extensions projecting one from the ball and the other from the socket, one of them may be used for attachment of the device to a base or support and the other for attachment thereto of the incandescent lamp. The two extensions can be varied in their form to adapt them for the particular use to which the device may be intended to be applied. Not only is the "transmitter" carried by the carriage but also the transmitter-support, and this feature of having the "support" carried by the carriage whether connected directly or indirectly to the carriage I consider broadly novel.

Having described my invention and set forth its merits, what I claim is—

1. The combination with a flexible sound transmitter and means for its attachment to and detachment from a movable carriage, of a support sustaining the outer end of said transmitter and adapted to be carried by the carriage, substantially as and for the purposes set forth.

2. The combination with a flexible sound transmitter and means for its attachment to and detachment from a movable carriage, of a support adapted to be carried by the carriage for sustaining the outer end of the transmitter, said support being adjustable for holding the transmitter at various angles of inclination, substantially as and for the purposes set forth.

3. The combination with a flexible sound transmitting tube constructed to be attached to and carried along by a movable carriage, of a jointed support adapted to be carried by the carriage for sustaining the outer end of

the tube, said support permitting the outer end of the tube to be turned sidewise, substantially as and for the purposes set forth.

4. A support for a flexible sound transmitting tube comprising arms or extensions movable one relatively to the other, and means for attaching them to the tube, substantially as and for the purposes described.

5. In a support for a flexible sound transmitting tube, the combination with a member capable of sustaining the outer end of the tube when attached to a base carried by a movable carriage and jointed to permit adjustment of the tube, of means for securing said member to the tube so as to be carried along therewith, substantially as and for the purposes described.

6. A sound transmitter support provided at different points with means for attachment to said transmitter so that the support may be sustained by said transmitter and said support sustain the outer end of the transmitter, substantially as and for the purposes described.

7. The combination with a flexible sound transmitter, of a support for the outer end of the transmitter, said support being sustained from and carried by said transmitter, substantially as and for the purposes set forth.

8. The combination of a plurality of sockets provided with attaching means, an arm connecting both sockets and having a movable and elastic connection therewith, and means for regulating the tension of the connection between the arm and at least one of the sockets, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WM. G. HENDERSON.

Witnesses:

JAMES L. NORRIS,

JAMES A. RUTHERFORD.

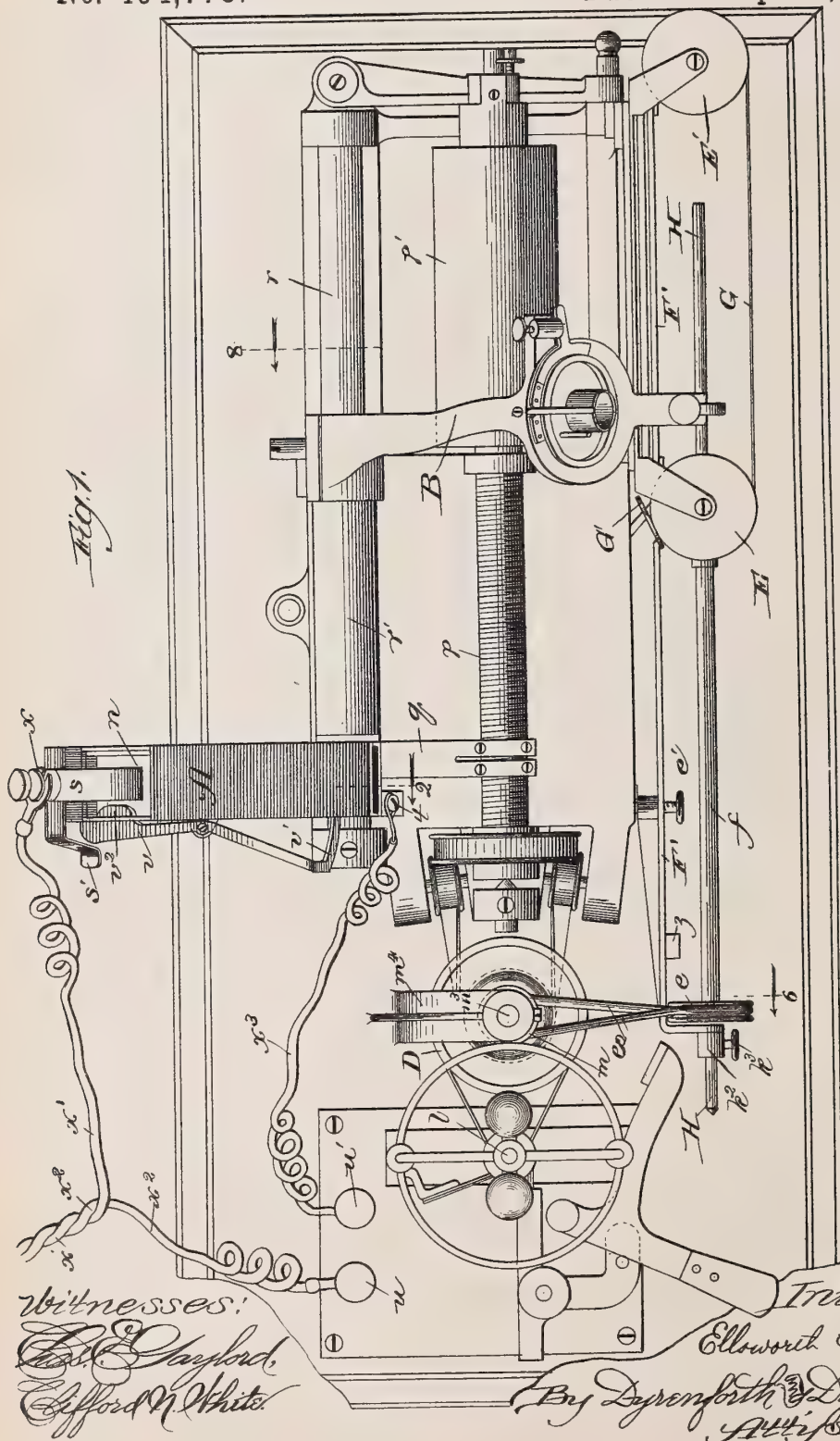
(No Model.)

3 Sheets—Sheet 1.

E. E. FLORA.
COIN OPERATED PHONOGRAPH.

No. 494,778.

Patented Apr. 4, 1893.

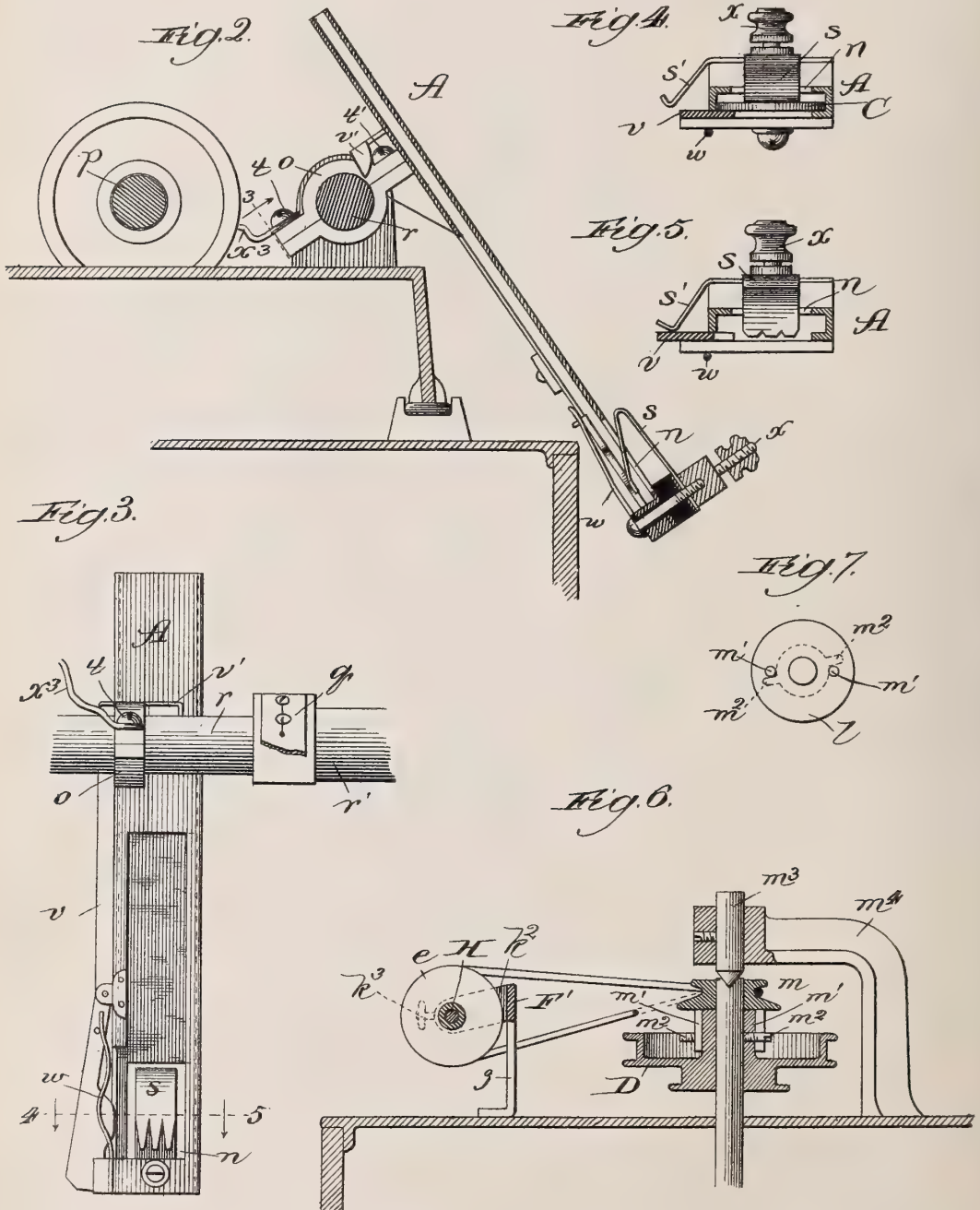


THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

E. E. FLORA.
COIN OPERATED PHONOGRAPH.

No. 494,778.

Patented Apr. 4, 1893.



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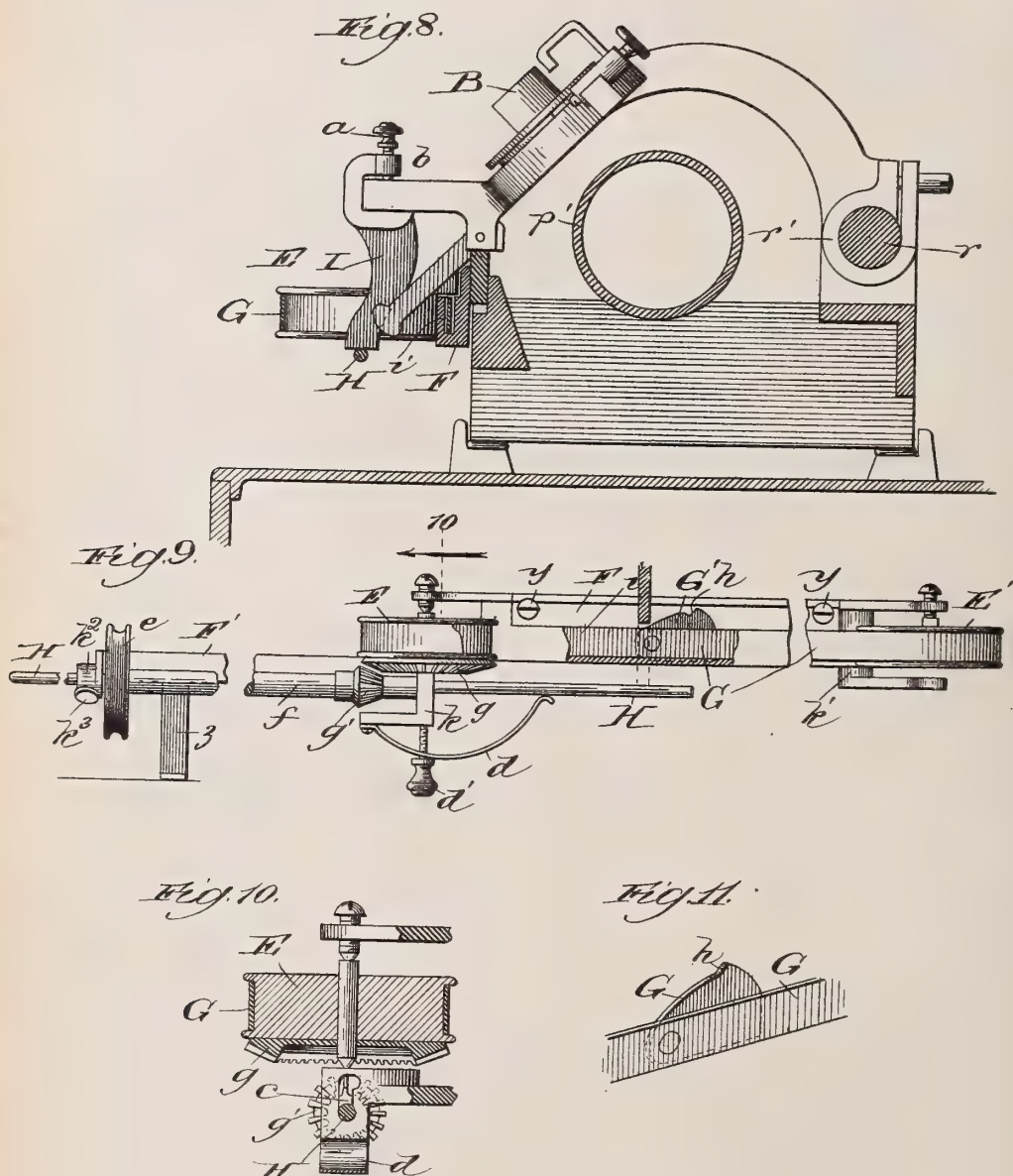
(No Model.)

3 Sheets—Sheet 3.

E. E. FLORA.
COIN OPERATED PHONOGRAPH.

No. 494,778.

Patented Apr. 4, 1893.



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UNITED STATES PATENT OFFICE.

ELLSWORTH E. FLORA, OF CHICAGO, ILLINOIS, ASSIGNOR TO GEORGE B. HOIT.

COIN-OPERATED PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 494,778, dated April 4, 1893.

Application filed July 31, 1890. Serial No. 360,536. (No model.)

To all whom it may concern:

Be it known that I, ELLSWORTH E. FLORA, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Coin-Operated Phonographs, of which the following is a specification.

My invention relates to an improvement in the class of attachments for use upon the phonograph to cause it, by the insertion of a coin or token, (intended to represent the price for the privilege of using the instrument,) into a coin-chute, in turn to close the circuit, and thus induce operation of the phonograph, then release the coin, and, finally, effect the return of the carriage to its initial position.

My improvement, while it relates, generally, to the entire coin-actuated mechanism, relates especially to the device for effecting, automatically, the return to its initial position of the phonograph-carriage; my main object being, in that connection, to provide a simply constructed, readily and reliably operating, and durable returning apparatus.

Further objects are to afford generally improved means for producing the automatic operation of a phonograph by the insertion of a coin or circuit-closing token into a slot.

In the accompanying drawings—Figure 1 is a plan view of a phonograph provided with my improvement; Fig. 2, a section taken at the line 2 of Fig. 1, viewed in the direction of the arrow, and showing the construction of the coin-chute and circuit controlling mechanism thereon; Fig. 3, a section taken at the line 3 of Fig. 2 and viewed in the direction of the arrow. Figs. 4 and 5 are sections taken, respectively, on the line 4—5 in Fig. 3, the former showing the parts of the chute in their relative positions with a coin inserted, and the latter showing their subsequent relative positions. Fig. 6 is a section taken on the line 6 of Fig. 1 and viewed in the direction of the arrow; Fig. 7, a bottom plan view of a detail; Fig. 8, a section taken at the line 8 of Fig. 1 and viewed in the direction of the arrow; Fig. 9, a view in broken front elevation of the automatic returning mechanism; Fig. 10, a section taken at the line 10 of Fig. 9, viewed in the direction of the arrow and enlarged; and Fig. 11, a perspective view of a broken

portion of the endless band of the returning mechanism supporting the dog.

A is the metallic coin-chute supported, preferably as shown, on the shaft *r* of a phonograph, which shaft carries the phonograph-carriage involving the sliding sleeve *r'* surrounding the shaft *r* and carrying the stylus-device B and the finger *q*, which engages at its free end with the thread on the screw-shaft *p* carrying the cylinder *p'*.

To support the chute A, I provide, to extend from its rear side, a split collar, *o*, the parts of which are secured together around the shaft *r*, by screws *t* and *t'*, (the latter fastening the chute and collar together) whereby it may be readily loosened to permit the chute to be adjusted on the shaft nearer to or farther from the end thereof, toward which the carriage travels in the operation of the phonograph, depending on the extent of travel desired for the carriage.

Near the lower end of the upper side of the chute, which should be open along a portion of its under side to permit the inserted coin to drop out when released in the manner hereinafter described, is an opening, *n*, into which projects a flat metal spring, *s*, extending from the lower end of the chute, from which it is insulated, being secured in place by a binding-post, *x*. Another spring, *s'*, projects laterally at a right-angle to the spring *s*, being secured by the same means that fasten the last-named spring and bent over the side of the chute beyond which it projects, as shown. A metal lever, *v*, fulcrumed between its extremities to the side of the chute A at which the spring *s'* projects, extends at one end into contact with the spring *s'*, being controlled, to tend normally to make such contact, by a spring, *w*. The opposite upper end of the lever *v* is provided with a finger, *v'*, bent to extend, under the chute, parallel with the shaft *r* into the path of the sleeve *r'*.

The circuit runs as follows: By the wires *x'*, from the battery (not shown) respectively to the binding-post *x* on the chute, and the terminal *u* of the phonograph-motor (not disclosed); the opposite terminal being connected by a wire, *x''*, with the screw *t* on the collar *o*. Thus, as will be seen, if contact be produced between the lever *v* and spring *s'*, or

the spring s be electrically connected with the chute A, the circuit will be closed, thereby setting the motor in operation, and, through the medium of the gearing illustrated, driving the screw-shaft p , the rotation of which produces the travel of the carriage in the usual and well-known manner in phonographs.

When the carriage is in its normal initial position, as represented in Fig. 1, the end of the sleeve r' on the shaft r , nearest the collar o , bears against the finger v' of the lever v , thereby forcing the lower, contact-end, of the latter inward, and maintaining it out of contact with the spring s' until the sleeve r' is moved to advance on its route and permit the spring w , by thus freeing it, to operate to force the lower end of the lever into contact with the spring s' . Therefore, the carriage being, normally, in the initial position referred to, obviously the circuit is normally open, owing to the separation of the spring s' and lever v , and of the spring s at its free end, from the chute A.

By inserting a coin, C, (Fig. 4) into the chute A, it slides down the latter until it makes contact with the spring s , thereby producing electrical connection between that spring and the chute, being prevented from falling out of the open under side of the chute by the normally inward projecting laterally enlarged end v^2 of the lever v ; so that when the coin is inserted, it closes the circuit and operates the phonograph. When the sleeve r' , in the operation of the instrument, has moved away, on the route of the carriage, sufficiently far to remove its end from the finger v' of the lever v , thus freeing the latter, the spring w , controlling it, is permitted to act to force the lower end v^2 outward, thereby depriving the coin of its support and allowing it to drop out (into a suitable receptacle, not shown). While this dropping out of the coin breaks the electrical connection between the chute A and spring s , it does not open the circuit, since before that connection is broken, another is made between the lever v and spring s' , which latter continues the operation of the instrument until the carriage is returned to its initial position, wherein it effects opening of the circuit and thus stoppage of the motor, by the bearing of the sleeve r' against the finger v' .

The gear-mechanism referred to between the motor and screw-shaft p may be of the well-known or any suitable construction, though inasmuch as it is desirable that the coin-operating attachment constituting the subject of my improvement, shall be applicable to the instrument without in any, at least appreciable, manner, disfiguring it, I prefer to construct, accordingly, the connection between the pulley m , from which to drive my automatically operating returning mechanism, hereinafter described, and the pulley device D, through the medium of which

the governor-shaft l is geared to the screw-shaft p . To that end, I make use of the stops m^2 , in the form of screws (Figs. 6 and 7) which are commonly inserted transversely into opposite sides of the hub extending upward from the pulley D, and provide on opposite sides of the pulley m , pins, m' , to extend vertically downward from opposite sides of the center of the pulley, being far enough apart to embrace the said hub between them, thus permitting the pulley m to be adjusted by placing it on the hub, causing the pins m' to embrace the latter, and turning it until stopped by contact of the pins with the stops m^2 . The tapering bearing m^3 , supported in the bracket m^4 , engages the upper side of the pulley m .

The returning-mechanism for the carriage, hereinbefore referred to, involves the following construction: E and E' are two guide-pulleys, supported in suitable bearings, k and k' , extending from opposite ends of a lever, F, which should be provided, longitudinally, with a guide-slot, i . This bar may be supported on the instrument in any desired or suitable manner, as by forming the cross-head of a bracket to be secured to the base of the instrument. As shown, (Fig. 9) I fasten the bar F, by screws, y , to the frame of the instrument supporting the shafts p and r . An endless band, G, is supported around the peripheries of the horizontally disposed pulleys E and E', and carries, rigidly secured to it, a dog, G', having its upper edge inclined downward from a backward-inclined stop, h . The under side of the pulley E is provided with a beveled gear-wheel, g , to be engaged by a beveled pinion, g' , on a sleeve, f , surrounding a portion of the length of a rod, H, loosely supported, in the manner hereinafter described, in the bearing k , through which it passes, and toward its opposite end, in a bearing, k^2 , having a set-screw, k^3 , on a bar, F', forming an extension of the bar F, to which it is secured, and propped by a leg, z . I also provide, in the bar F', a horizontally disposed set-screw, e' , (Fig. 1) to bear against the frame of the machine and serve for springing the bar outward and inward, with reference to the frame, to adjust it and thereby tighten or loosen the belt e^2 , connecting the pulley m with a vertically disposed pulley e on the adjacent end of the sleeve f , thereby to rotate the latter on its supporting-rod H and thus drive the beveled pinion g' . The pinion g' tends normally to engage with the gear g by a spring, d , extending from the bearing k against the under side of the adjacent portion of the longitudinally adjustable rod H, the spring being adjustable to bear with greater or less pressure against the rod, by a set-screw, d' (Fig. 9). The meshing of the pinion g' and gear g is prevented, however, during the travel of the phonograph-carriage from its initial position, by a tongue, I, on the stylus-device B resting upon the rod H and thus bearing down upon it, thereby springing it toward its free end to

maintain the two gears out of mesh, the opening *c* (Fig. 10) in the bearing *k'* for the passage of the rod, being elongated to permit this transverse movement of the rod H. When, in the travel of the carriage, it passes beyond the end of the rod H, the latter is free to be raised by its controlling spring *d*, thereby producing engagement of the pinion *g'* with the gear-wheel *g*. The tongue I should be separably connected with the end *b* of the stylus-device B, being secured in position by a set-screw, *a*, in order that in respect thereto also, the original instrument need not be altered in the application of my improvement.

The entire operation of the device is as follows: On inserting a coin C into the chute A, it produces, in the manner already described, electrical connection between the springs *s* and chute, and, by the consequent closing of the circuit, actuates the motor to drive the screw-shaft *p* and thus produce the travel of the carriage in the common manner. While the carriage is moving forward, it maintains the pinion *g'* out of mesh with the gear *g* by the bearing of its tongue I against the rod H, so that although the pinion rotates constantly while the circuit remains closed, (since the pulley *m* geared to the pulley *e* on the sleeve *f* carrying the pinion must rotate, being secured to the pulley D) it performs no work until the tongue I clears the rod H. The extent of the portion of the rod H upon which the tongue bears may be increased or diminished, by sliding it in the proper direction, to increase or diminish the extent of forward travel of the carriage. In moving, the sleeve *r'* is withdrawn from its bearing effect against the finger *v'* of the lever *v*, thereby permitting the spring *v²* to act to remove the lower end of the lever to the contact-spring *s'*, and, by thus removing the support from the coin, permitting it to drop out of the opening in the back of the chute A, but, as already explained, without opening the circuit. When the tongue I has passed the end of the rod H, the spring *d* raises the latter, producing engagement of the pinion *g'* with the gear-wheel *g*, rotating it and, through it, the pulley E. This causes the endless band G to travel, whereby the dog G' is eventually brought against the tongue I and raises it to turn the stylus-device B, and through it the sleeve *r'*, back on the shaft *r*, and thus also raise the finger *q* out of engagement with the thread on the shaft *p*, freeing the carriage to enable it to be returned without obstruction. The return is produced by the continued travel of the band G, causing the dog G', at its stop *h*, to push the carriage at the tongue I along ahead of the dog, until the sleeve *r* strikes the collar *o*, which stops the carriage, the dog clearing the tongue by passing under it, which it does without material obstruction therefrom, owing to the inclination of the stop *h*. As the sleeve *r* reaches the end of its return-route, it bears against the finger *v'* and thereby breaks the contact between the lever *v*

and spring *s'*, thus opening the circuit, stopping the motion of the driving-mechanism, and placing the parts into their relative positions illustrated, in which they are adapted to be again actuated by an inserted coin.

Obviously my improved circuit-controlling mechanism may be used with a phonograph independently of my particular, or any, carriage-returning mechanism; and my automatically operating returning mechanism may be employed with advantage on the phonograph with any circuit-closing device, whether coin-operated or not.

The broad principle involved in my improvement is that of employing an endless carrier to operate, when the carriage reaches a predetermined point, to return it. Hence I do not wish to be understood as limiting my invention to the exact means shown and described for producing automatically the return of the carriage, as these may be variously changed without thereby departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination with a phonograph and its motor, a coin-chute, A, in circuit with the motor and supporting two contacts, the one closing the circuit by an inserted coin, and the other closing the circuit on the escape of the coin from the chute, substantially as described.

2. In combination with a phonograph and its motor, a coin-chute, A, in circuit with the motor, and supporting a contact, *s*, closing the circuit by the insertion of a coin, and a contact, *s'*, and a lever, *v*, normally controlled by the phonograph-carriage to support the coin in the chute and released by the advance-movement of the carriage to engage with the contact *s'*, and free the coin, substantially as described.

3. In combination with a phonograph and its motor, a coin-chute, A, in circuit with the motor, and having an opening for the escape of the inserted coin and supporting a contact, *s*, in the path for the coin, and a contact, *s'*, and a spring-controlled lever, *v*, extending one side of its fulcrum into the path of the phonograph-carriage, and at the opposite side thereof into proximity with the contact *s'* and said opening in the chute, substantially as described.

4. In combination with a phonograph and its motor, a chute, A, adjustably supported, in circuit with the motor, on the shaft *r*, and supporting contact-mechanism for closing the circuit by a coin inserted into the chute, substantially as described.

5. In combination with a phonograph and its motor, a coin-chute, A, in circuit with the motor and having an opening for the escape of the inserted coin and adjustably supported on the shaft *r*, a spring-contact, *s*, in the path for the coin, a spring-contact, *s'*, a spring-controlled lever, *v*, tending, under the influence of its controlling-spring, to engage, at one

end, the contact s' , and extending at its opposite end into the path of the phonograph carriage, and normally maintained by the carriage out of engagement with the contact s' and in position to support the coin in the chute, substantially as described.

6. In combination with a phonograph and its carriage, an endless carrier, G , engaging means upon the endless carrier and phonograph-carriage, driving-mechanism for the endless carrier actuated from a motor and normally out of gear with the endless carrier, and mechanism, substantially as described, for throwing the driving-mechanism into gear at a predetermined point in the progressive movement of the carriage to actuate the endless carrier to return the carriage, substantially as set forth.

7. In combination with a phonograph, an endless carrier, G , provided with a dog, G' , extending therefrom to engage with the phonograph-carriage, and provided with a stop h from which the upper edge inclines downward, driving-mechanism for the endless carrier actuated from a motor and normally out of gear with the endless carrier, and mechanism, substantially as described, for throwing the driving-mechanism into gear at a predetermined point in the progressive movement of the carriage to actuate the endless carrier to return the carriage, substantially as set forth.

8. In combination with a phonograph, an endless band, G , on horizontally disposed pulleys E and E' , a dog, G' , on the band, a tongue, I , on the phonograph carriage, extending into the path of the dog, a gear-wheel, g , on the pulley E , a spring controlled rod, H , supported in bearings and surrounded by a sleeve, f , carrying a pulley, e , at which it is geared with the driving-mechanism, and a pinion, g' , normally maintained out of gear with the wheel g by the tongue I bearing down on the rod H against its spring the whole being constructed and arranged to operate substantially as described.

9. In combination with a phonograph, an endless band, G , on pulleys, E and E' , supported on bearings, k and k' , extending from a bar, F , having a longitudinal guide-slot, i , for the endless band, a dog, G' , on the band G , a tongue, I , on the phonograph-carriage extending into the path of the dog, a gear-wheel, g , on the pulley E , a bar, F' , forming an extension of the bar F and provided with a bearing, k^2 , a spring-controlled rod, H , supported and longitudinally adjustable in the bearings k^2 and k , and surrounded by a sleeve, f , carrying a pulley, e , at which it is geared with the driving-mechanism, and a pinion, g' , normally maintained out of gear with the wheel g by the tongue I bearing down on the rod H , the whole being constructed and arranged to operate substantially as described.

10. In combination with a phonograph and its motor, a coin-chute, A , in circuit with the motor and having an opening for the escape of the inserted coin and supporting a contact, s , in the path for the coin and a contact, s' , and a spring-controlled lever, v , extending at one side of its fulcrum into the path of the phonograph-carriage and at the opposite side thereof into proximity with the contact s' and said opening in the chute, an endless band, G , on horizontally disposed pulleys, E and E' , a dog, G' , on the band, a tongue, I , on the phonograph-carriage, extending into the path of the dog, a gear-wheel, g , on the pulley E , a spring-controlled rod, H' , supported in bearings and surrounded by a sleeve, f , carrying a pulley, e , at which it is geared with the driving-mechanism, and a pinion, g' , normally maintained out of gear with the wheel g by the tongue I bearing down on the rod H , the whole being constructed and arranged to operate substantially as described.

ELLSWORTH E. FLORA.

In presence of—

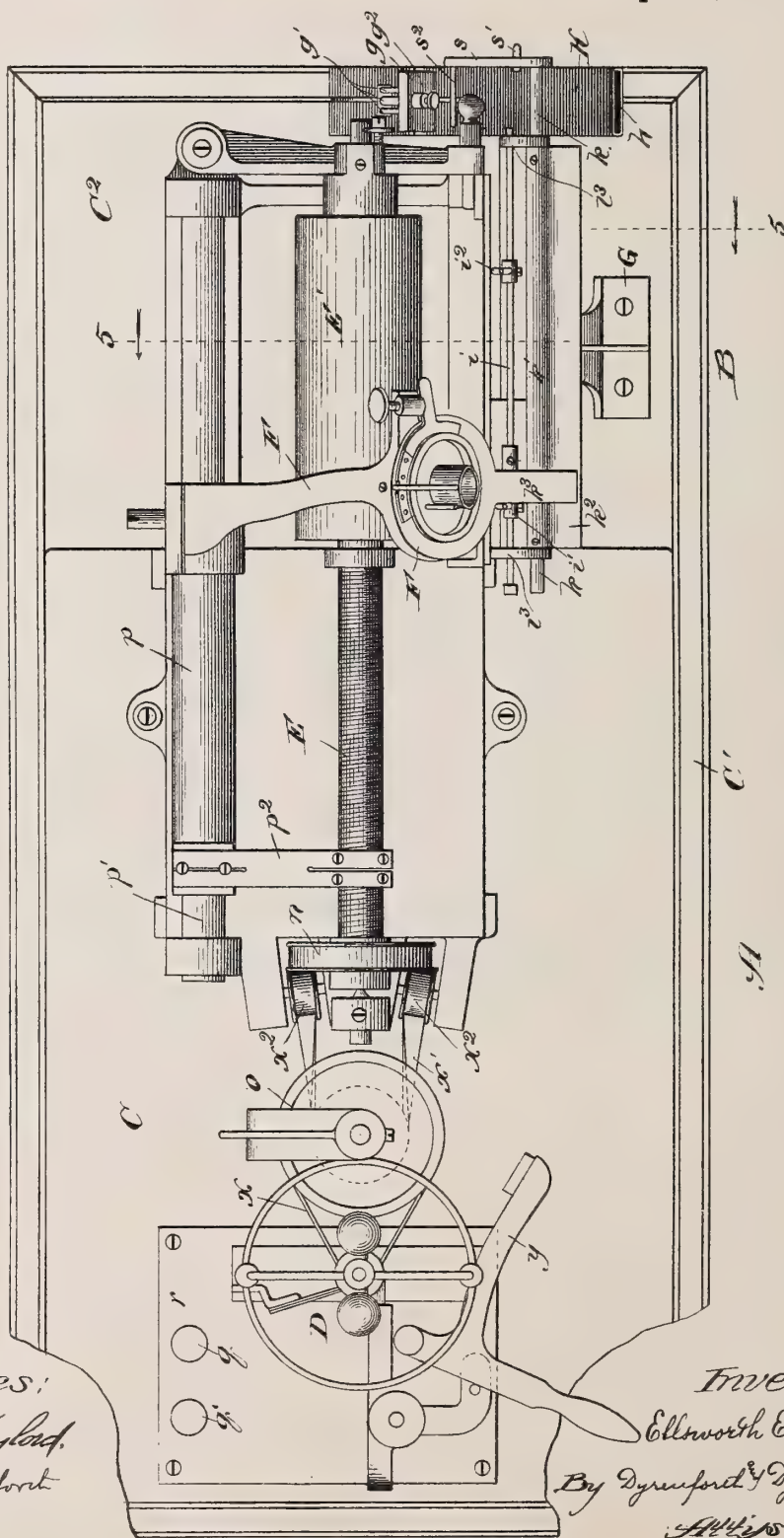
J. W. DYRENFORTH,
M. J. FROST.

E. E. FLORA.
COIN OPERATED PHONOGRAPH.

No. 494,807.

Patented Apr. 4, 1893.

Fig. 1.



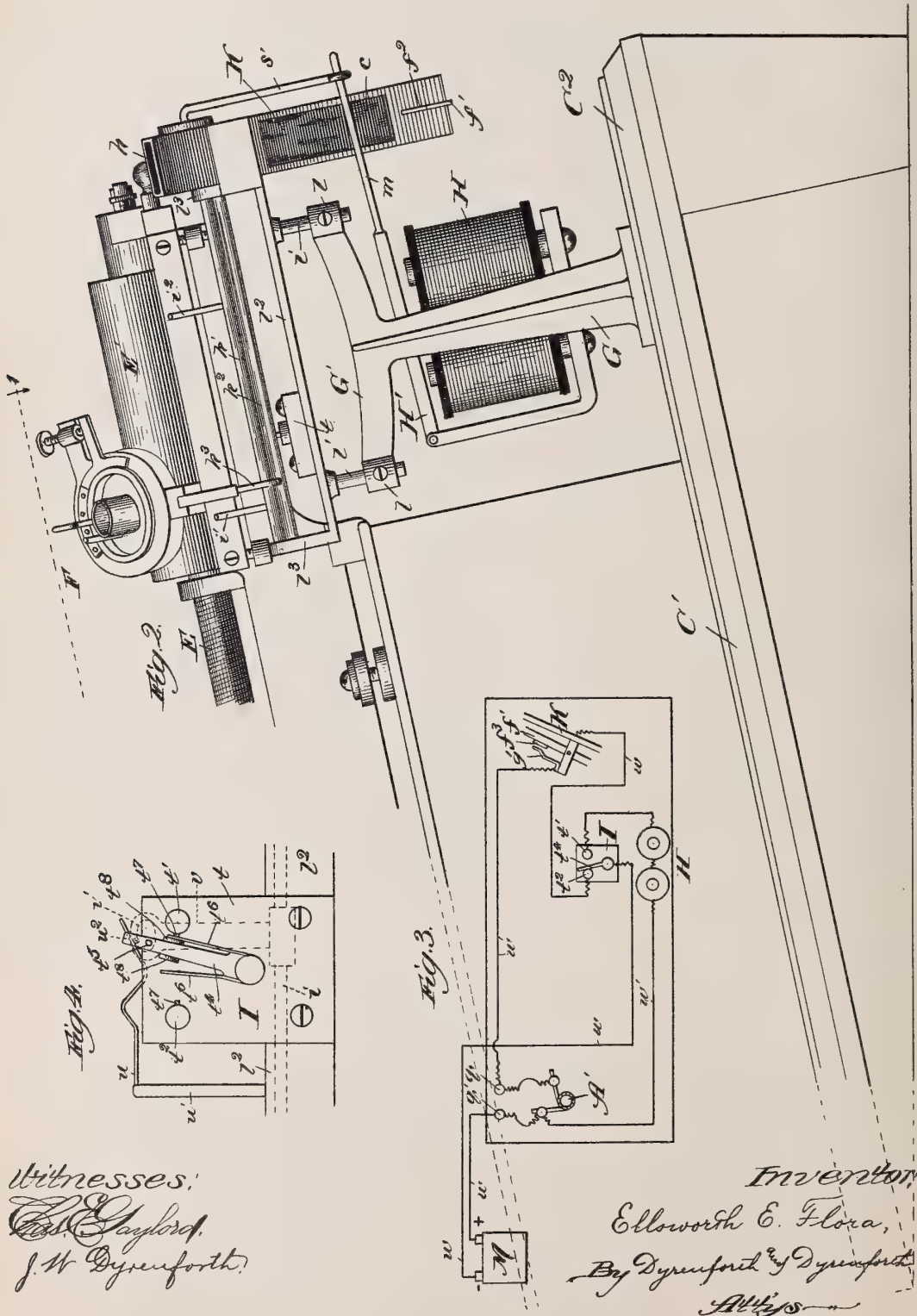
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E. E. FLORA.
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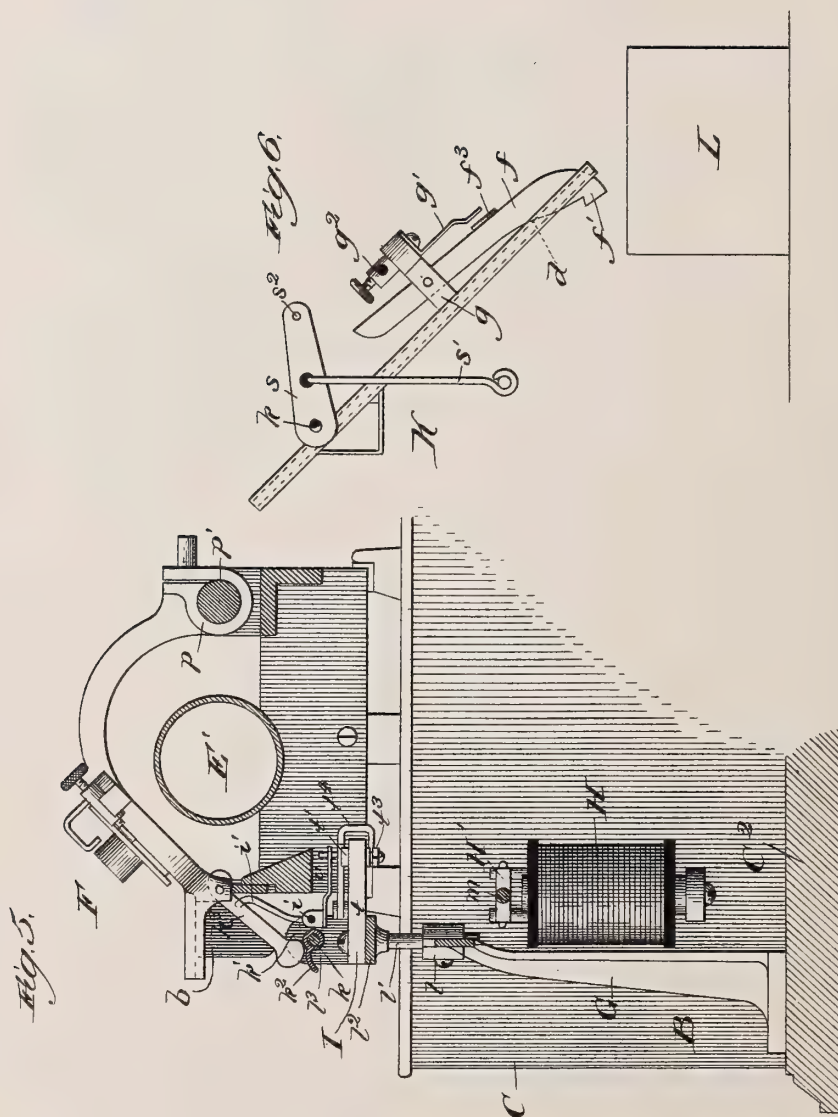
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No. 494,807.

Patented Apr. 4, 1893.



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UNITED STATES PATENT OFFICE.

ELLSWORTH E. FLORA, OF CHICAGO, ILLINOIS, ASSIGNOR TO GEORGE B. HOIT.

COIN-OPERATED PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 494,807, dated April 4, 1893.

Application filed May 5, 1890. Serial No. 350,575. (No model.)

To all whom it may concern:

Be it known that I, ELLSWORTH E. FLORA, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Coin-Operated Phonographs, of which the following is a specification.

My invention relates to an improvement upon the phonograph, or analogous instrument, whereby it may be caused to operate by the insertion of a coin representing the price for the privilege of operating it.

My object is to afford to the general public, by placing my improvement in localities accessible to them, opportunity, at small cost to each individual using the instrument, to become acquainted with and be entertained by the phonograph, and thereby, also, to provide a source of revenue from the device.

In the accompanying drawings—Figure 1 is a top view, regarded along the plane of the line 1 of Fig. 2, of a phonograph provided with my improved attachment for permitting it to be operated by the insertion of a coin.

Fig. 2 shows my attachment in elevation as applied to a phonograph, of which only so much is represented in the view as will serve for the illustration of my improvement, including, as an important feature the inclination whereby the reproducing stylus may be returned automatically to its initial position after each use of the instrument. Fig. 3 is a diagram showing the circuits operated by the insertion of the coin; Fig. 4, a plan view of a switch-detail; Fig. 5, a section taken on the line 5—5 of Fig. 1 and viewed in the direction of the arrows; and Fig. 6, a view in side elevation of the coin-chute and its immediate attachments.

The details of the construction for an improvement such as mine, or rather so much thereof as relates directly to the operation by inserting a coin, are preferably of a nature enabling them to be combined as an attachment to be applied to a phonograph or analogous instrument, without requiring the latter to be in any way especially adapted to permit the application, thereby not only avoiding difficulty in the application but also mutilation of the phonographic instrument. Accordingly I prefer to provide my improvement in the form

of a readily removable and adjustable attachment, without however intending to be understood as limiting my invention to a construction essentially involving the attachment as a distinct part of the instrument, inasmuch as I desire to claim a coin-operated phonograph as broadly as the state of the art will permit.

A is a phonograph, and B my improved attachment for permitting it to be operated by the insertion of a coin.

As the application of my improvement does not, as constructed, involve any alteration of the construction of the phonograph proper, which is well-known, the latter is not shown in all its details in the accompanying drawings, and need not be minutely described herein.

Inside the box C, below the block τ , is the motor A' (merely indicated in Fig. 3) of which q and q' are the binding-post terminals; y is the switch; D, the governor, o the horizontal-pulley-device, geared to the governor by the band x , and by the band, x' , passing around the guide-pulleys x^2 , to the pulley n on an end of the screw E, carrying, toward its opposite end, the cylinder E', which supports the waxed-cylinder (not shown) to receive the record from the stylus-device F, extending from the sleeve p on the guide-rod p' and carrying the stylus-actuating arm p^2 , normally engaging with the screw E.

On the extension C² of the base C' of the box C, (where it is common to provide a type-writer attachment) I provide a bracket, G, having secured to its vertical portion an electro-magnet, H, provided with the pivotal armature, H', extended from its free end as a finger, m . At opposite ends of the cross-head G' of the bracket G are sockets, l , to receive posts, l' , adjustably secured therein and supporting a bar, l^2 , having at its opposite end, bearings, l^3 , in which to journal a rock-shaft, k . On the shaft k , extending between the bearings l^3 , is secured, to move with the shaft, a sleeve, k' , having a lateral flange, or lip, k^2 , over which extends, transversely, a rigid tongue, k^3 , from the hinged stylus-device F. At the end of the shaft k , where it projects beyond its bearing l^3 nearest a finger, i^2 , is secured a finger, s , to extend at an angle from

the shaft, and having the finger-end m of the armature H' , connected with it eccentrically by a link, s' ; and near the free end of the finger s , is a stud, s^2 , extending inward at a right-angle from it. In the bearings l^3 , behind the shaft k , is supported a longitudinally sliding rod, i , having secured to it, preferably, as shown, in a manner to render them adjustable, upward projecting fingers, i' and i^2 , extending at their upper ends into the path of the tongue k^3 , and located near the opposite extremities of the play of the tongue by the movements of its supporting stylus-device F . Near the finger i' is rigidly secured on the rod i (also preferably in a manner to permit it to be adjusted lengthwise of the rod) a finger, v , forming the medium for actuating, by lengthwise movement of the rod i a switch, I , illustrated in detail in Fig. 4. The switch I comprises a block, t , of insulated or insulating material (as hard rubber) secured to the bar l^2 to extend beyond the inner edge of the same and provided near its free edge with contacts, t' and t^2 , extending through the block and formed at the lower side thereof into binding-posts, t^3 (Fig. 5). A metallic tongue, t^4 , is pivoted at one end near the center of the block t , to extend along the top of the same, and is bent at its free end over and under the inner edge of the block, being provided on its upper side with a stud, t^5 , entering a slot, v' , formed transversely in the free end of the finger v . At opposite edges of the tongue t^4 , I provide light platinum-tipped contact-springs, t^6 , extending into the plane of the contacts t' and t^2 , there to engage, for the better contact with the latter, with platinum-pointed studs, t^7 , projecting laterally therefrom; and the contact-portion of the tongue t^4 may for the same purpose, be laterally expanded, as shown at t^8 . A light spring, u , is secured at one end to a post, u' , extending horizontally from the bar l^2 at one side of the switch I ; and the spring engages toward its free end with a stud, u^2 , on the under side of the tongue t^4 , where it extends underneath the block t , the spring being bent, as shown, to engage and hold the tongue yieldingly at each end of its throw.

K is a metallic chute secured to an end of the bar l^2 , and shaped to admit flatwise into it through the opening or "slot" h at its upper end, a coin of the denomination representing the charge for the use of the phonograph. The chute inclines downward from the insertion end h to a coin-receptacle, L , represented in Fig. 6. On the upper side of the chute K (as shown, about midway between its extremities) is secured a bearing-block, g , which should be formed of metal, and has secured to its forward side an insulated metallic spring, g' , with which is connected a binding-post, g^2 . A metallic lever, f , extends through and is pivotally supported in the block g , and projects at its rear end into the path of the stud s^3 on the arm s . At its forward end, the lever f is formed into approxi-

mately a hook-shape, as shown at f' , Fig. 6, and there normally projects through a slot, f^2 , formed, to admit it, longitudinally through the chute toward its lower end; and on the upper edge of the lever f , below the free end of the spring g' , it may be expanded, as shown at f^3 , to increase the contact-surface with it of the spring g' .

To provide for the operation, produced in the manner hereinafter described, I arrange the circuits as diagrammatically represented in Fig. 3. From the positive pole of the battery M the line w leads by way of the binding-post q' through the motor A' , thence to the normally open contact g' ; and from the chute K , with which the lever f' is metallically connected, through the switch I , at its terminal t^2 , back to the negative pole of the battery. From the positive end of the motor A' proceeds a branch-circuit, w' , through the electro-magnet H to the terminal t' of the switch I . Thus the circuit w will be closed by producing electrical contact between the spring g' and lever f ; and if the tongue t^4 , of the switch I , be turned from the post t^2 to the post t' , that circuit will be shunted through the magnet H , causing it to attract its armature H' and thereby permit eventual separation of the contacts g' and f' , at the same time effecting the release of the stylus F , and permitting the latter to slide, by gravity, back to its initial or starting position, in reaching which, its tongue k^3 engages with the upright finger i' on the longitudinally movable rod i , and by moving the latter with it turns the tongue t^4 of the switch I back to the contact t^2 .

The operation, in detail, is as follows: The parts, as illustrated, occupy their initial relative positions, whence the stylus F may be actuated to record the vibrations directed against its diaphragm or to repeat them after having been recorded by it on the cylinder provided for the purpose on the carrying cylinder E' . By inserting a suitable coin (as a nickel five-cent piece) into the chute K through its inlet-slot h , the coin falls in the chute till stopped by the hook-end f' of the pivotal lever f , extending longitudinally across the interior of the chute; and since the lever f is somewhat widened in vertical cross-section toward its end f' , as shown at d , Fig. 6, the thickness of the coin will raise it to bring its contact-portion f^3 against the contact g' , thereby closing the circuit w , owing to the arrangement of the latter hereinbefore described. Closing of the circuit w obviously sets the motor A' in motion, and causes it to turn the screw E and cylinder E' in the usual manner of a phonograph. The revolving screw E , by engagement with it of the arm p^2 , slides the sleeve p carrying the stylus-device F along and up the inclined guide-rod p' , causing the device F to perform its well-known function. The finger i^2 is adjusted in position near the end of the course (which may be predetermined, by adjustment of either or

both fingers i' and i^3) of the stylus-device F, whereby, when the latter reaches such finger i^2 , through engagement therewith of its tongue k^3 it slides the rod i in the direction of the movement. This, obviously, moves the finger v in the same direction, and by the engagement with the latter, at its slot v' , of the tongue t^1 of the switch I, the said tongue is turned from the contacts t^2 to the contacts t' , thereby shunting the current to the branch-circuit w' and energizing the magnet H. The magnet then attracts its armature H' , which, in responding, draws with it, through the medium of the link s' on its extension m , the arm s , thereby bringing the stud s^2 down against the rear end of the lever f and raising it toward its opposite end (thus, momentarily, still farther than it was raised and held by the inserted coin) against the spring g' far enough to remove its hook or stop end from the path of the coin, which then resumes its passage through the chute K and discharges therefrom into the coin-receptacle L. A further, and equally important effect of the attraction of the armature H' , is to cause the link s' , by drawing downward the arm s , which is firmly secured to the rock-shaft k , to turn the latter and with it the sleeve k' , (which moves with the shaft or may be integral with it) thereby raising the lip k^2 of the sleeve against the tongue k^3 of the stylus-device F, and, as a consequence, turning the latter backward and, necessarily, also its supporting-sleeve p and the arm p^2 , whereby the arm p^2 is raised out of engagement with the threads of the screw E, (which not only effect the movement of the stylus-device, but, besides, are relied upon to hold it wherever it is moved.) When thus released, the sleeve p is free to slide down the inclined guide-rod p' and carry with it the arm p^2 and the stylus-device F toward their initial positions, in attaining which, the tongue k^3 strikes the finger i' in its path, and thus slides the rod i longitudinally in the direction of the movement, which carries the finger v with it and through the latter returns the tongue t^1 of the switch I into contact with the post t^2 . This breaks the circuit w' , and releases the armature H' , which then rises by the weight of the parts connected with it, and in doing so raises the stud s^2 from the rear end of the pivotal lever f , permitting the latter to fall, toward its opposite heavier end, into its normal position, illustrated, and break contact with the spring g' , thereby opening the circuit w ; and with the release of the armature, furthermore, obviously, the sleeve k' with its tongue k^2 is rocked with the shaft k forward to their normal positions, permitting the tongue k^3 to follow and thus produce re-engagement of the arm p^2 with the screw E.

The details of the construction involved in my improvement, and thus minutely described, while they are believed best to answer my purpose, may, obviously, be variously modified without thereby departing from the spirit of my invention; hence I do not wish

to be understood as limiting my improvement to such details.

On reference to Fig. 2, it will be noticed that the chute K is open throughout a part of its extent along its under side, as shown at c ; this is to cause coins of smaller denomination than the prescribed to fall out after insertion, and before reaching the lever f . It will also be noticed that the tongue k^3 secured flexibly to the stylus-device F, is rigid for my purpose, and so rendered by the wedge b , which however may be adapted to be readily inserted and withdrawn.

Although the appended claims refer to the instrument provided with my improvements by the term "phonograph," I desire that term to be construed as including any analogous instrument to which they are susceptible of application, as the graphophone.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination, a phonograph, and an electrical coin-actuated attachment having a chute, K, and means for intercepting a coin introduced into the chute, consisting of a single lever, f , pivotally supported to extend, normally, across the chute-passage, the chute and lever being in a normally open electric circuit containing the phonograph-motor, said circuit being closed by the inserted coin, substantially as described.

2. In combination, a phonograph, and an electrical coin-actuated attachment, having a chute, K, and means for intercepting a coin introduced into the chute, comprising a single lever, f , having a stop, f' , near one end normally obstructing the passage through the chute, the chute and lever being in a normally open electric circuit containing the phonograph-motor, said circuit being closed by the inserted coin, substantially as described.

3. In combination, a phonograph, having an automatically returning gravity-actuated stylus-device, and an electrical coin-actuated attachment, B, having a chute, K, and means for intercepting a coin introduced into the chute, consisting of lever, f , normally obstructing the passage through the chute, the chute and lever being in a normally open electric circuit, containing the phonograph-motor said circuit being closed by the inserted coin, and means, substantially as described, actuated from the stylus-device in advancing to release and permit its return by gravity, substantially as set forth.

4. In combination, a phonograph having an automatically returning gravity-actuated stylus-device, and an electrical coin-actuated attachment, B, having a chute, K, and means for intercepting a coin introduced into the chute, consisting of lever, f , normally obstructing the passage through the chute, the chute and lever being in a normally open electric circuit, containing the phonograph-motor said circuit being closed by the inserted coin, and means, substantially as described, actuated from the stylus-device, in

advancing, to release it and permit its return by gravity, and from the said stylus-device in returning, to remove the lever *f* from obstructing the chute-passage, substantially as and for the purpose set forth.

5 5. In combination, a phonograph, having its guide-rod *p'*, for the stylus device, inclined downward toward the initial position of the said device, and an electrical coin-actuated
10 attachment, B, having a chute, K, provided with a lever, *f*, normally obstructing the passage through the chute, the chute and lever being in a normally open electric circuit, *w*, containing the phonograph-motor and closed
15 by the inserted coin, a branch, *w'*, of the circuit *w*, containing an electro-magnet, H, provided with an armature, H', a switch, I, in the said circuits, operated from the moving
20 stylus-device, and means, substantially as described, controlled from the armature and actuated by its attraction with the advance of the stylus-device, to disengage the latter and permit its return by gravity and to remove
25 the lever *f* from obstructing the chute-passage, the whole being constructed and arranged to operate substantially as set forth.

6. In combination, a phonograph having its stylus-device F provided with a rigid or prac-

30 tically rigid tongue, *k*³, and its guide-rod *p'*, for the stylus-device, inclined downward toward the initial position of the said device, and an electrical coin-actuated attachment, B, having a chute, K, provided with a lever, *f*, normally obstructing the passage through
35 the chute, the chute and lever being in a normally open electric circuit, *w*, containing the phonograph-motor and closed by the inserted coin, a branch, *w'*, of the circuit *w*, containing an electro-magnet, H, provided with an
40 armature, H', a switch, I, in the said circuits, operated by the tongue of the moving stylus-device, a rock-shaft, *k*, having a lip, *k*², engaging the tongue *k*³, and carrying an arm, *s*,
45 linked to the armature, and extended across the plane of the rear end of the lever *f*, and fingers, *i'* and *i*², supported near opposite ends of the course of the stylus-device on a
longitudinally sliding bearing, *i*, carrying a
finger, *v*, engaging the switch I, the whole being constructed and arranged to operate sub-
50 stantially as described.

ELLSWORTH E. FLORA.

In presence of—

J. W. DYRENFORTH,

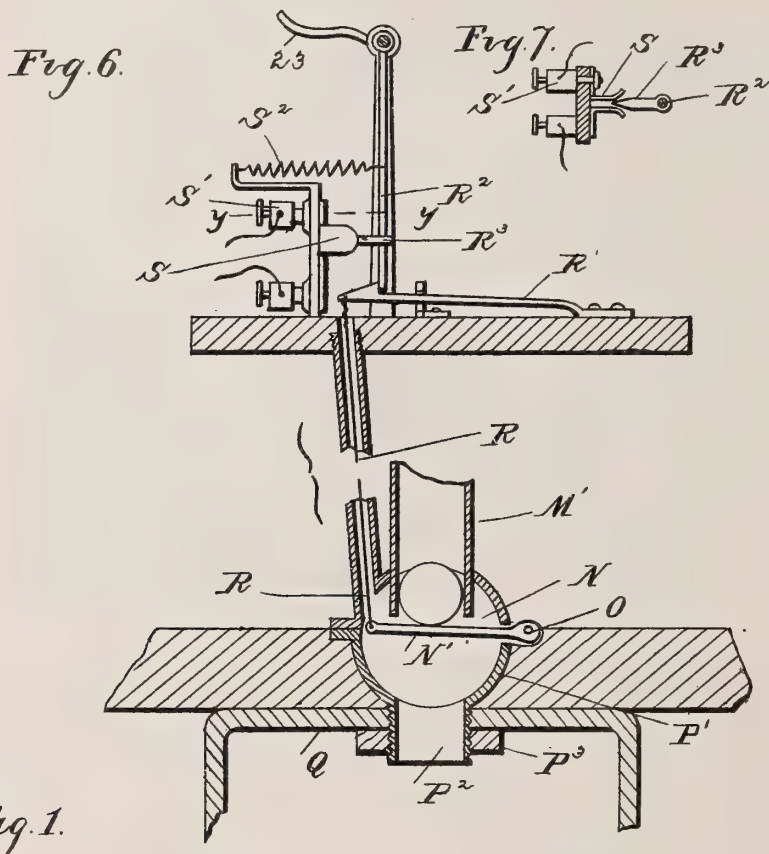
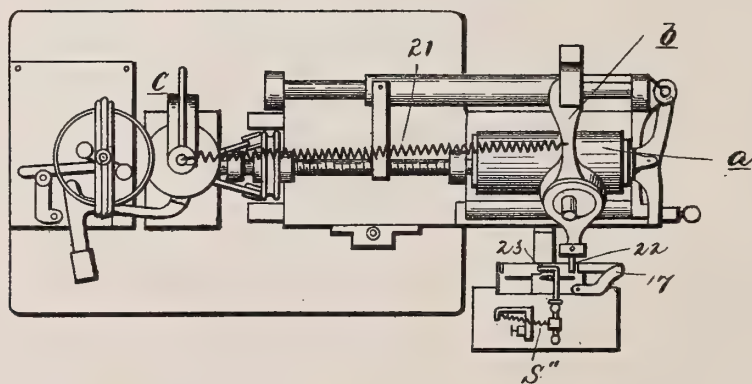
M. J. FROST.

J. H. LING.

COIN OPERATED MECHANISM FOR PHONOGRAPHS.

No. 495,557.

Patented Apr. 18, 1893.

*Fig. 1.*

Witnesses
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M. B. Magherly

Inventor
Jacob H. Ling
 By *Mrs. E. Magherly*
 Attys

(No Model.)

4 Sheets—Sheet 2.

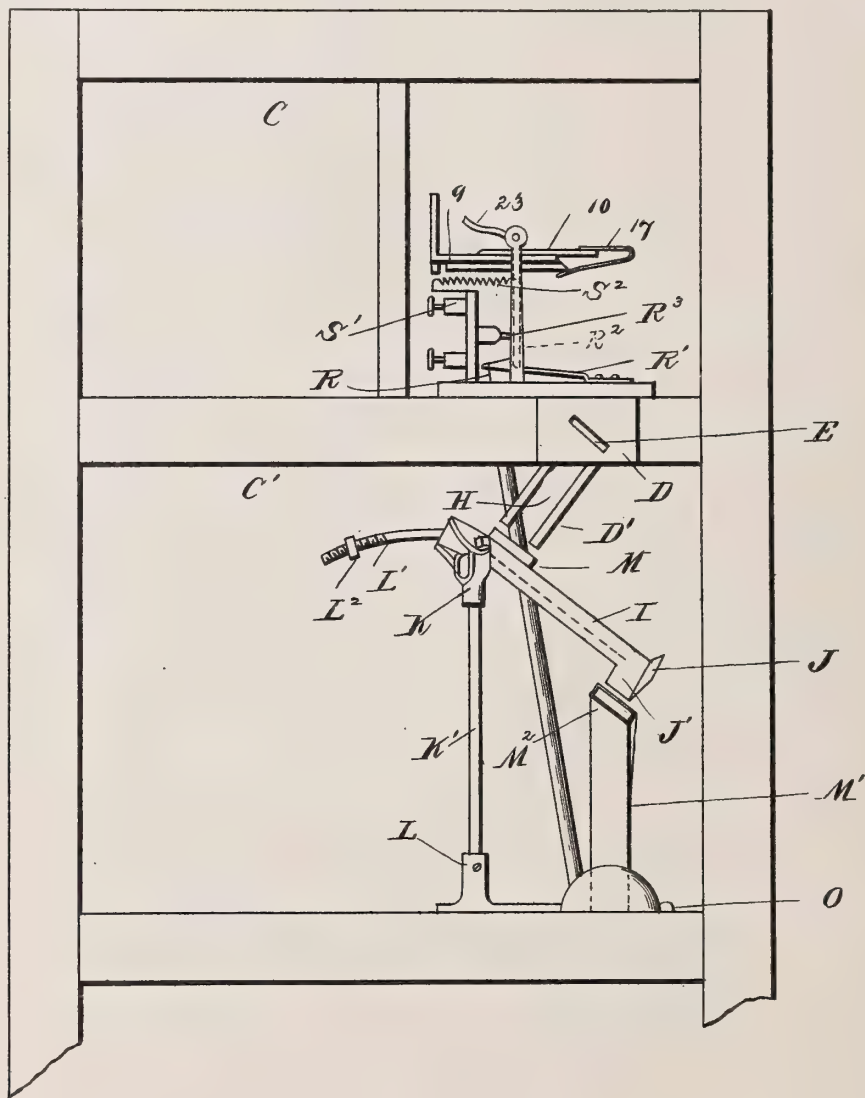
J. H. LING.

COIN OPERATED MECHANISM FOR PHONOGRAPHS.

No. 495,557.

Patented Apr. 18, 1893.

Fvg. 2.



Inventor

Jacob H. Ling

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J. H. LING.

COIN OPERATED MECHANISM FOR PHONOGRAPHS.

No. 495,557.

Patented Apr. 18, 1893.

Fig. 3.

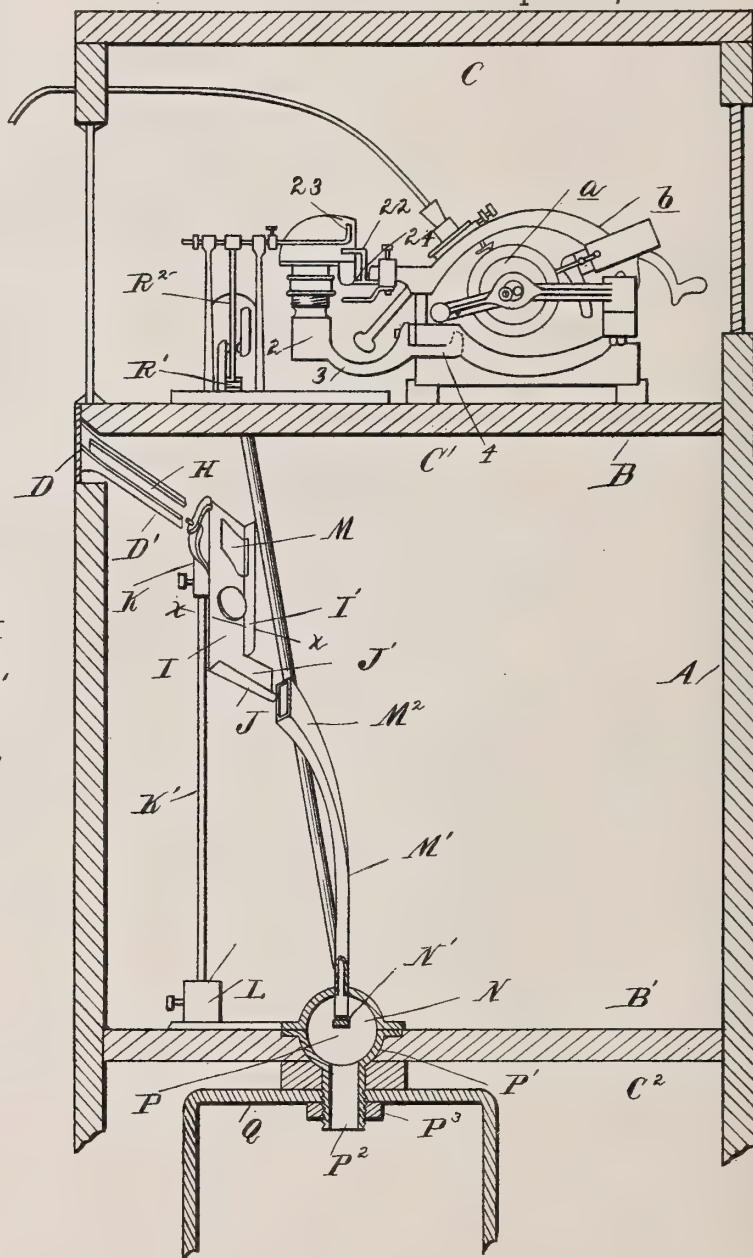


Fig. 4.

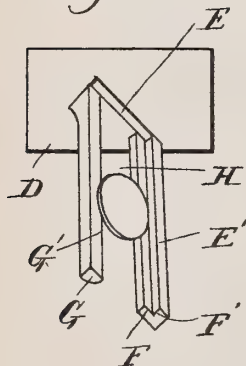


Fig. 5.



Witnesses
 R. L. Kooie
 Th. R. DeGherthy

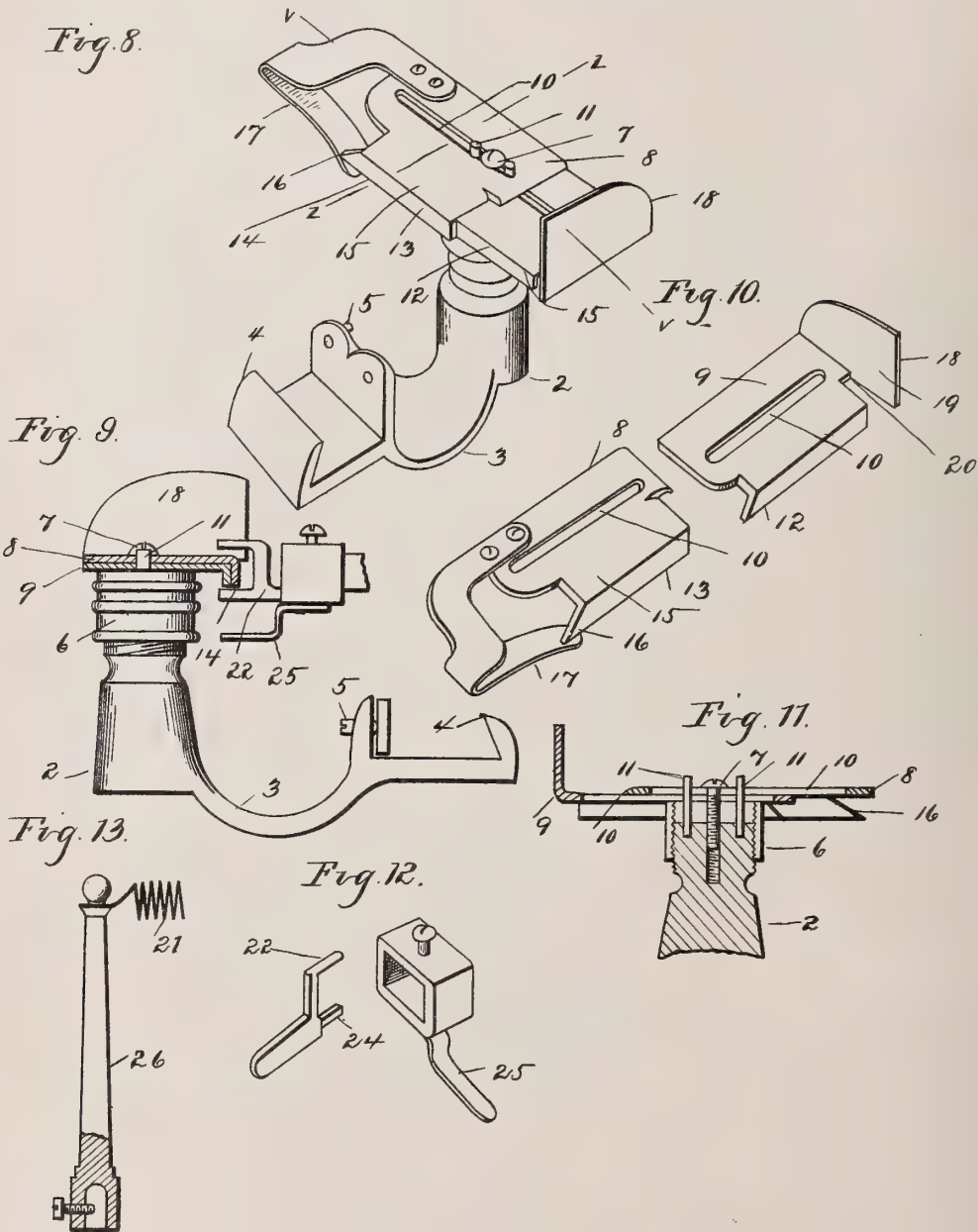
Inventor
 Jacob H. Ling
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 Attys

J. H. LING.

COIN OPERATED MECHANISM FOR PHONOGRAPHS.

No. 495,557.

Patented Apr. 18, 1893.



Witnesses
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UNITED STATES PATENT OFFICE.

JACOB H. LING, OF DETROIT, MICHIGAN.

COIN-OPERATED MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 495,557, dated April 18, 1893.

Application filed June 4, 1891. Serial No. 395,137. (No model.)

To all whom it may concern:

Be it known that I, JACOB H. LING, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Coin-Operated Mechanism for Phonographs, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in coin operated mechanism and especially designed for use in connection with phonographs, &c., in which there is a movable part designed to be returned to a definite point.

The invention relates first to the peculiar construction of the coin chutes whereby the operation of the machine with coins of improper dimensions or with "slugs" is prevented. Second, in the peculiar construction of the mechanism for setting the motor in operation. Third, in the peculiar construction of the return mechanism, and fourth, in the peculiar construction, arrangement and combination of the various parts all as more fully hereinafter described.

In the drawings, I have shown my machine applied to a phonograph for which I have especially designed it.

Figure 1 is a plan view of a phonograph to which my invention is applied. Fig. 2 is a front elevation thereof. Fig. 3 is an end elevation thereof. Fig. 4 is a detached elevation of the slotted chute. Fig. 5 is a cross section on line *x x* of the balanced chute. Fig. 6 is an enlarged section through the discharge chute and trip mechanism showing the contact making device in elevation. Fig. 7 is a section on line *y y*, Fig. 6. Fig. 8 is a detached perspective view of the return mechanism. Fig. 9 is a cross section thereof on line *z-z*, Fig. 8. Fig. 10 is a perspective view of the adjustable guide plates detached. Fig. 11 is a vertical longitudinal section on line *v-v* Fig. 8. Fig. 12 is a perspective view of the guide finger and cap of the phonograph carriage, showing the finger turned at right angles to its normal position. Fig. 13 is a side elevation, partly in section, of the spring supporting post.

A is the casing divided by the lateral partitions B B' into the three chambers CC' and

CC'. In the upper chamber is a phonograph of ordinary construction, comprising a cylinder *a*, a carriage *b* and a motor *c*. The motor is connected with any suitable battery having a make and break connection in the circuit controlled by my improved device.

I will now describe the construction of the coin chutes: D is a plate adapted to be sunk flush with the face of the casing, as plainly shown in Fig. 3 and provided with the diagonal aperture E of substantially the size of the coin by which the machine is designed to be operated. Upon the inner face of this plate and preferably formed integral therewith is the downwardly extending inclined chute D', more plainly shown in Fig. 4, consisting of the lower bar E' having the flat face F and the flange or ledge F' forming the notch for the lower edge of the coin to roll on. The upper edge of the coin is supported on the upper bar G which has simply a flat face G'. Between the two is an open slot H. This construction of chute causes the coin to rest partially upon its flat face and partially upon its edge, getting a sufficient amount of friction to prevent its moving at too great speed, and at the same time not giving a sufficient amount of friction to cause a sticky or moist coin to stop and clog it up. The slot H designed for an abrupt right angle nickel machine is of slightly less width than the width of that coin, so that any coin of smaller size will fall through this slot and be prevented from passing into the operating part of the machine. At the foot of this chute is arranged a balanced or weighing chute I inclined longitudinally and laterally, and provided upon its lower edge with the flange I' to cause the nickel to roll in substantially the manner previously described. At its lower end this chute is provided with a flange J extending across the entire width of the chute and across the end of a lateral delivery chute J' formed at the lower end of the chute. By providing a transverse flange or stop, at the lower end of this chute so that the coin will be discharged from the side instead of the end, the coin is checked in its movement and the chute made to act more correctly and accurately. This chute is pivoted in the bifurcated bracket K which is adjustably secured by means of a set screw or other suitable device upon a stand-

ard K', these parts being so arranged that the bracket and chute may be adjusted rotatably as well as vertically. If desired, however, the vertical adjustment may be taken up in the base plate L by the means shown in Fig. 3. The chute I is provided with the stem L' preferably circular in cross section and screw threaded to receive the counter balancing weight L² which may be adjusted thereon by turning it to the right or left and thus balancing the chute with the utmost delicacy. Opposite the end of the chute D' I secure the guard plate M to prevent the coin from jumping out of the chute I. I also preferably separate the chute D' and the upper edge of the chute I a sufficient distance to cause the coin to jump in going from one chute to the other. This is to prevent the operation of the machine by a nickel or other coin tied to a string. The slow movement of such an article would not carry it across the space and it would fall into the cabinet without operating the mechanism. Opposite the mouth of the discharge spout J' is the mouth of a vertical chute M' having the upper bent portion M² so arranged that the upper edge of the chute would be at substantially right angles to the path of the discharge spout J'. This chute is secured at its lower end to the walls of the chamber N formed integral with the base plate, and extending above the same. This chamber N is preferably of semi-globular shape and of suitable size to allow a coin to be moved freely therein at any point around the trip bar N' which is hinged at O on the base plate, and extending across the base of the chute M' within the chamber N, as plainly shown in Fig. 6. Below the chamber N is a corresponding chamber P of semi-globular shape formed within the flanged cup P' and having a discharge nipple P² centrally secured to its lower edge and provided with a suitable screw thread to receive the nut P³, which not only clamps the cup P' in position, but also clamps a safe or receptacle Q to the under side of the partition B, as plainly shown in Fig. 3. It will be seen from this description that a coin or slug of less diameter than a nickel will fall through the slot H; that a slow moving coin will fall between the chute D' and the chute I; that a coin of proper size but of light weight will fall upon the chute I, but will not be of sufficient weight to move it downward a sufficient distance to bring the lateral discharge spout J' opposite the mouth of the chute M', while if it were too heavy to move it below the mouth of said chute it would fail to deliver it therein. If it be of the weight and size of a nickel, or is a nickel itself, it will enter the mouth of the chute M' passing there-through, will strike the latch N' and depress the same, thus being free to fall into the safe Q.

The trip bar or latch N' is adapted to close the circuit by means of mechanism of the following construction: R is a connecting cord or wire extending from the free end of the

trip bar N' to the outer end of the spring hook R', as shown in Fig. 6. This spring hook engages with the lower end of the spring jack R² which carries the contact block R³. The spring hook R' normally holds this block out of engagement with the contacts S, (Figs. 6 and 7) which are connected respectively to the terminals of the electric circuits, secured in the binding posts S'. This circuit extends from the electric battery to the motor of the phonograph. The striking of the coin upon the spring latch N' depresses that latch releasing the spring jack which is moved into engagement with the contacts by means of the spring S² starting the motor in operation, which moves the phonograph carriage forwardly causing it to reproduce whatever is upon the cylinder.

The mechanism which I employ for automatically returning the phonograph carriage when it has reached the end of its movement is preferably of the following construction: 2 is a standard having the curved arm 3 at its lower end, and the jaw 4 adapted to engage with the frame of the phonograph, as plainly shown in Fig. 3, being clamped thereto by the set screws 5. The standard 2 is screw threaded at its upper end to receive the adjusting screws 6. At the top of this standard are secured by means of the screw 7, the two plates 8 and 9. Each plate is provided with a slot 10 in which the pins 11 engage, these pins being secured in the top of the standard, all so arranged that these plates may be adjusted vertically by means of the screws 6 and 7, and may be adjusted in relation to each other to a greater or less length by loosening the screw 7 and sliding them upon each other. At the forward edge these plates are provided with depending flanges 12 and 13 respectively. The under edge 14 of this flange forms a guide rail for the forward movement of the arm 24 on the phonograph carriage, while the upper edge 15 forms a return rail upon which this arm rides. At the outer end of the flange 13 is formed an incline 16, which acts as a switch rail to guide the arm 24 from the rail 14 to the rail 15, a spring 17 acting to lift the arm 24 upon the switch rail as soon as it has passed beyond the end of the rail 14. At the outer end of the flange 12 is formed a stop 18 having the vertical guide face 19 extending down beneath the return rail. In the plate 9, beside this stop, and in the line of the return rail 15 is formed a well 20 of sufficient depth to allow of the arm 24 to pass therethrough. It is evident that as the motor moves the carriage forward the counter motor or spring 21 will be put under tension, and when the carriage has reached the end of the rail 14 it will be switched upon the return rail 15. In this position the reproducing needle of the carriage will be raised above the path of the phonogram blank, and the counter motor will return it to its initial position. When it reaches the end of the return rail, it will strike the stop 18 and be guided by the vertical face

19 in a line at right angles to the phonogram blank, thereby preventing any possibility of cutting or marring the blank as would be the case if the needle were allowed to scrape along the blank. In this return movement an arm 22 attached to the carriage strikes the rock arm 23 of the spring jack, and withdraws it from the contacts S allowing the spring hook R' to re-engage therewith and hold it out of contact, thereby breaking the circuit and stopping the motor.

25 is a finger engaging under the rail 14 in the return movement of the carriage, to prevent the tipping of the carriage by tipping the cabinet or casing.

26 is a standard secured to the shaft of one of the grooved wheels for driving the carriage, to which one end of the spring 22 is attached.

What I claim as my invention is—

1. In a coin operated device an inclined balanced chute having an abrupt right angled lateral stop at its lower end, substantially as described.

2. In a coin operated mechanism, a chute inclined longitudinally and transversely, a ledge at the lower edge thereof upon which the edge of the coin is adapted to run, an abrupt right angled stop at the end of the chute, a lateral spout on and extending beyond the edge of the chute and a delivery spout across which the lateral spout oscillates, substantially as described.

3. In a coin operated mechanism an inclined counterbalanced chute, a lateral spout thereon, extending out from and beyond the edge of the chute and a delivery spout across the open end of which the lateral spout oscillates, substantially as described.

4. In a coin operated device, the combination with a casing, of a plate in the casing having an oblique slot therein, a grooved extension on the plate at the lower end of the slot, an extension on the plate at the upper end of the slot, a swinging obliquely arranged chute at the end of and at an angle to the extension, a stop at the end of the chute and a delivery spout having its mouth arranged laterally beyond the chute adjacent to the stop, substantially as described.

5. In a coin operated device, the combination with the slotted plate and guide leading therefrom, of a swinging chute having a counter weight thereon, a stop at the lower end of the chute, and a delivery spout having its mouth arranged at the side of the chute adjacent to the stop, substantially as described.

6. The combination with the phonograph

carriage, the guide rail having a continuous contact surface with which said carriage engages, the switch at the end of said guide rail, a well at the opposite end, a vertical stop extending across the end of the rail beyond the well and a spring for causing the carriage to engage with the switch, substantially as described.

7. The combination with the phonograph carriage, a motor and a return mechanism, rails with which the carriage engages in its forward and return movement, a switch at one end and a stop at the other end of said rail forming a vertical guide for the carriage, substantially as described.

8. In a coin operated phonograph, the combination with a phonograph of a standard having a threaded upper end a slotted plate, a nut below the plate engaging the threaded end of the standard and means for adjustably securing the plate to the standard, substantially as described.

9. In a coin operated phonograph, the combination with the phonograph, of the standard provided with pins 11, nut 6 threaded upon the standard, plates 8 and 9 having slots 10 therein and provided with flanges 12 and 13 respectively and screw 7 for securing the plates to the standard, substantially as described.

10. In a coin operated mechanism, a receiving chute inclined transversely and longitudinally, a ledge at the lower side thereof upon which the edge of the coin is adapted to run, a longitudinally and transversely inclined balanced chute at the foot thereof separated therefrom a distance sufficient to allow a coin to pass between, and a spout located to one side of and beyond the lower end of the balance chute a distance sufficient to permit the passage of a coin, substantially as described.

11. In a coin operated device, the combination with the casing, of an open sided chute, a laterally and vertically inclined chute below the same at a point to form an intervening space between, an adjustable support, a pivotal connection between the same and said inclined chute, an adjustable counterweight on the inclined chute, a laterally arranged stop on the lower end of the inclined chute and a delivery spout, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JACOB H. LING.

Witnesses:

M. B. O'DOHERTY,
N. L. LINDOP.

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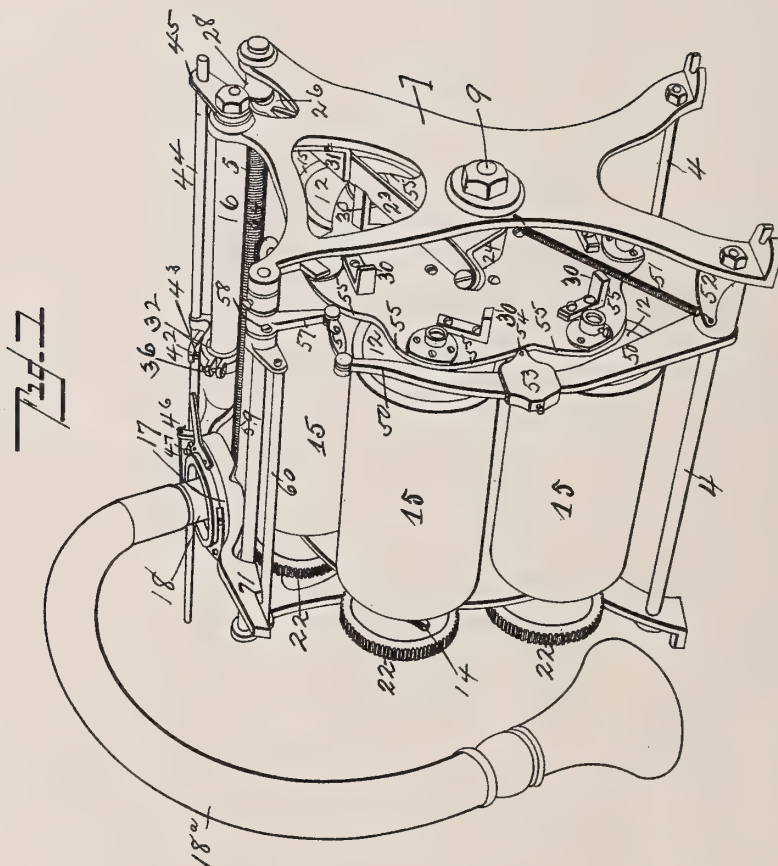
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8 Sheets—Sheet 1.

J. L. ATKINS.
TALKING MACHINE.

No. 495,869.

Patented Apr. 18, 1893.



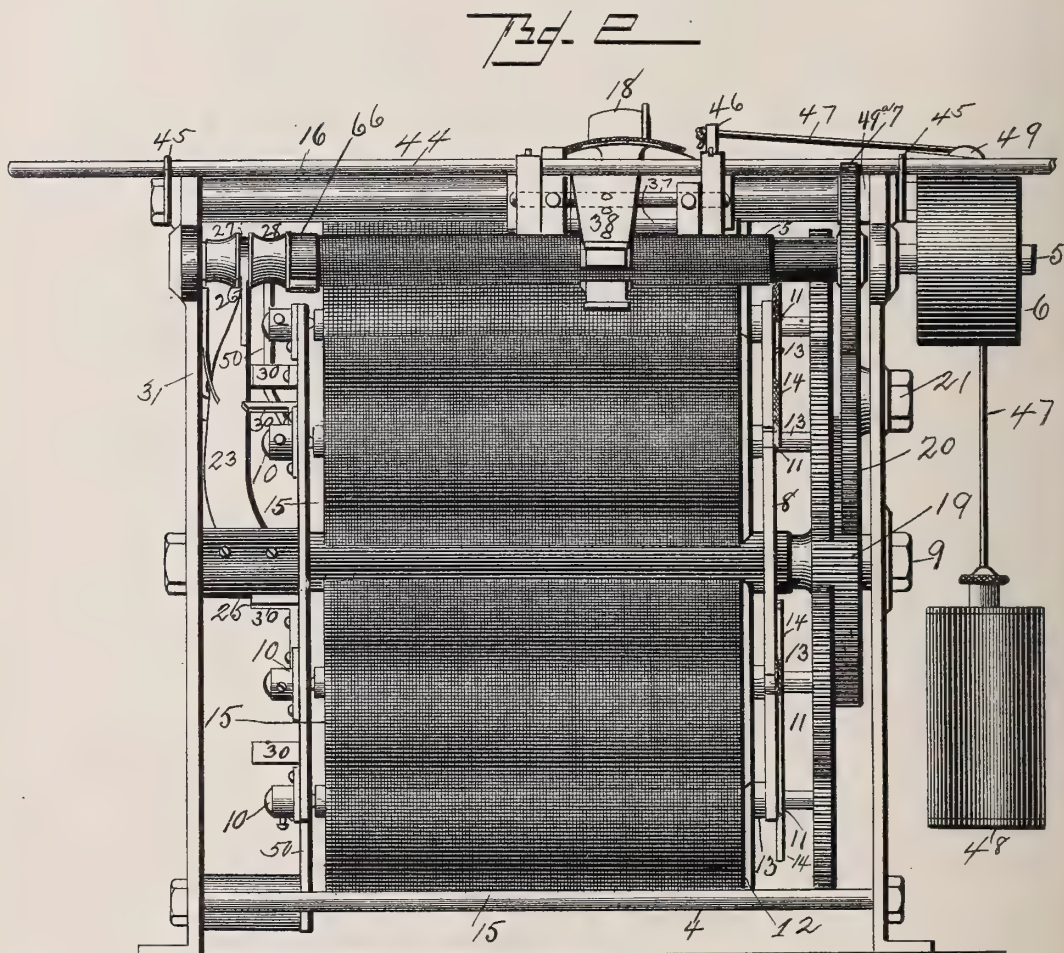
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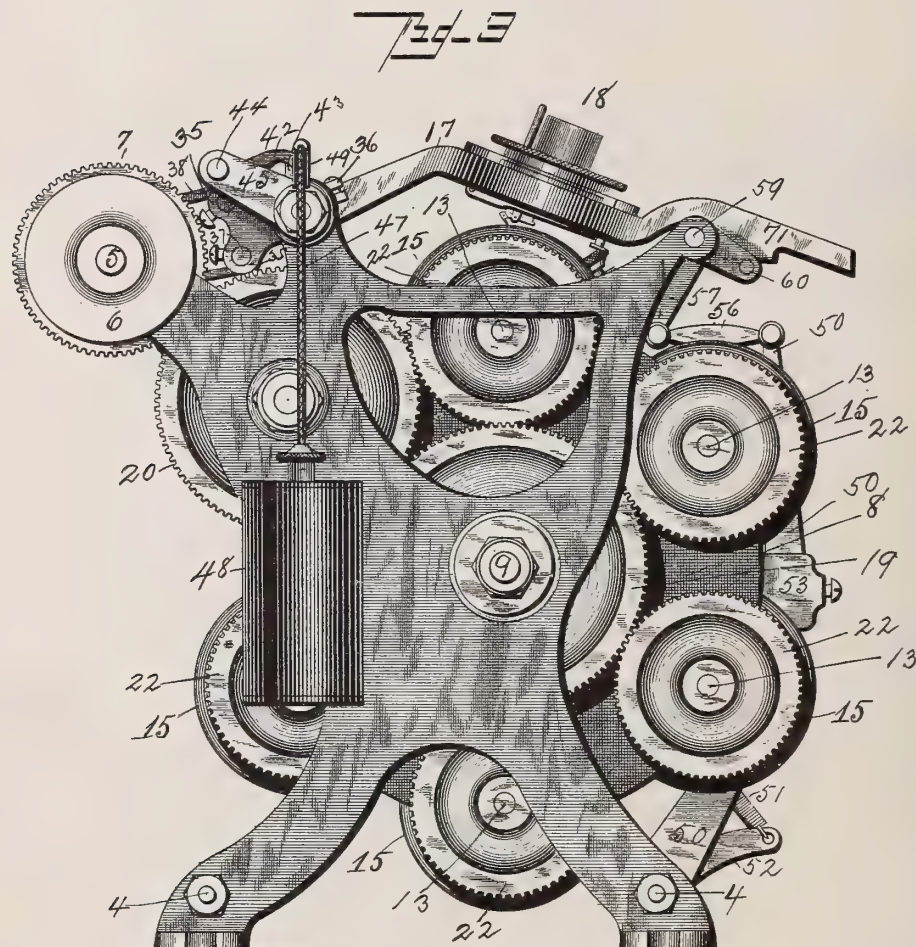
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Witnesses

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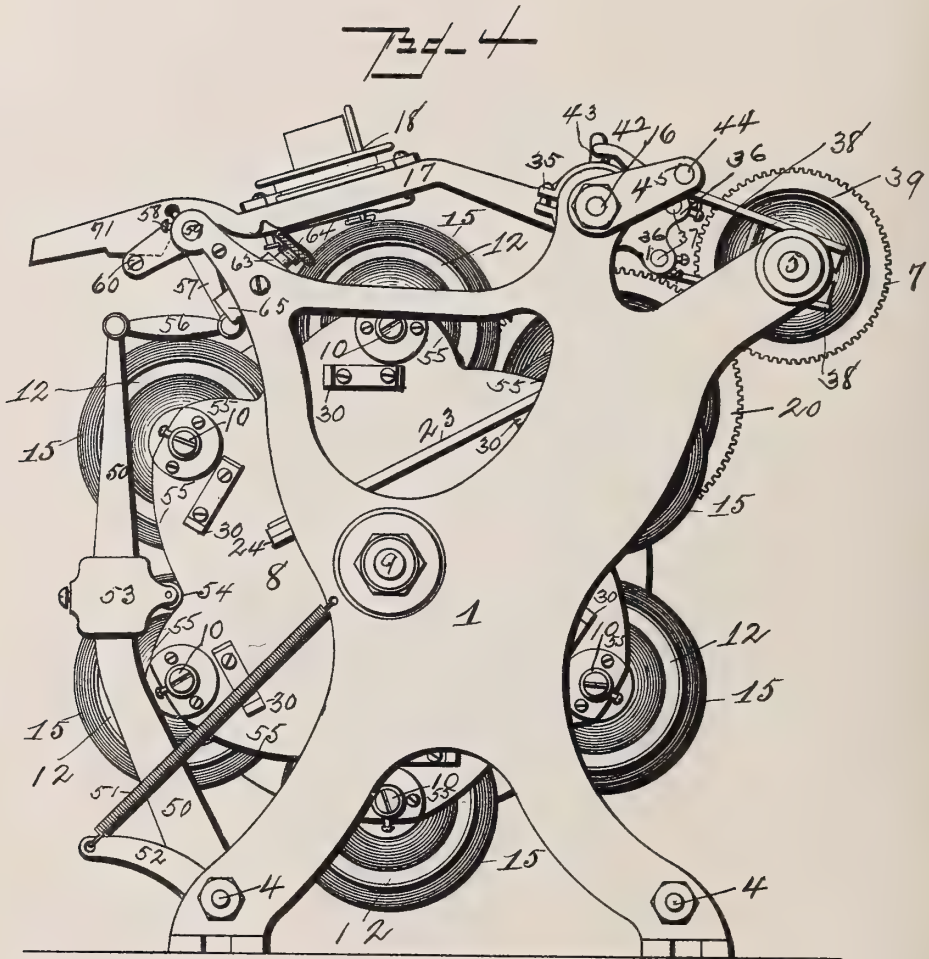
(No Model.)

8 Sheets—Sheet 4.

J. L. ATKINS.
TALKING MACHINE.

No. 495,869.

Patented Apr. 18, 1893.



Witnesses

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C. S. Frye

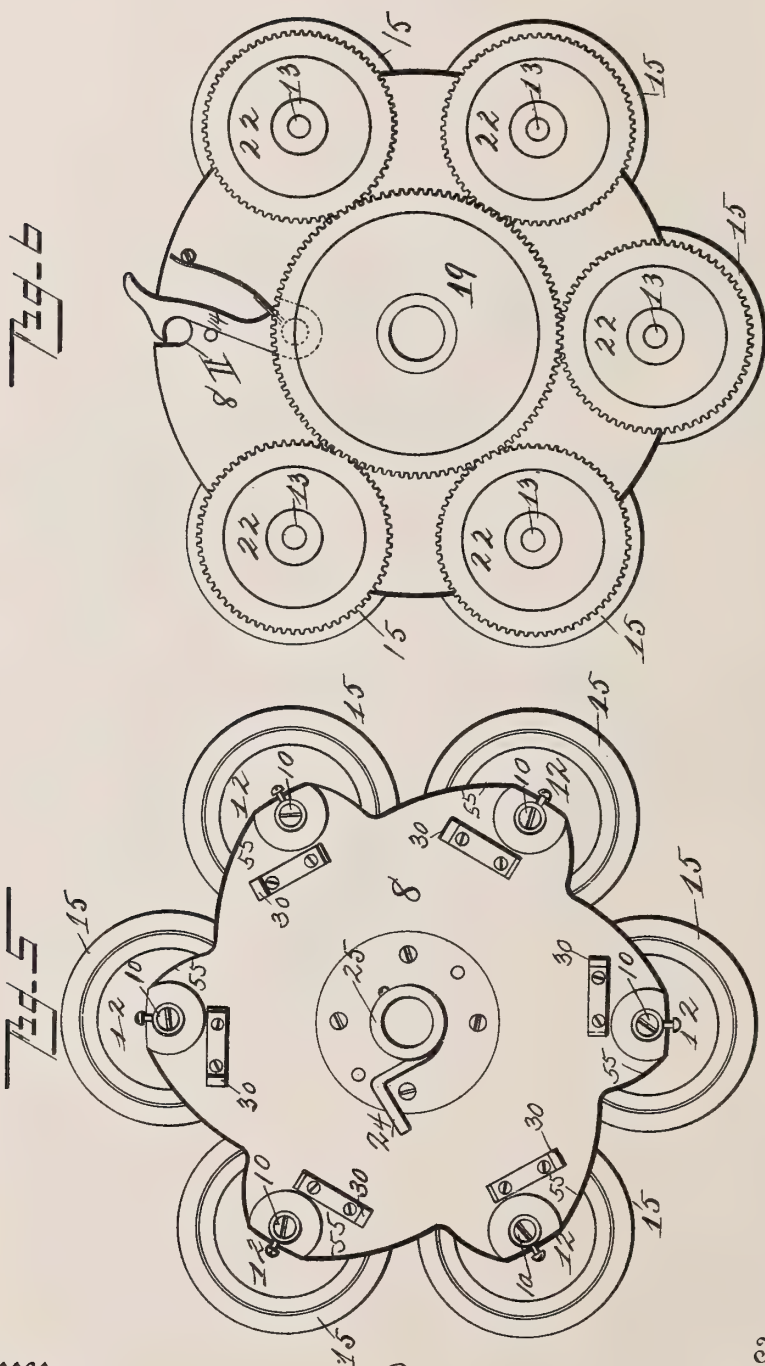
Inventor

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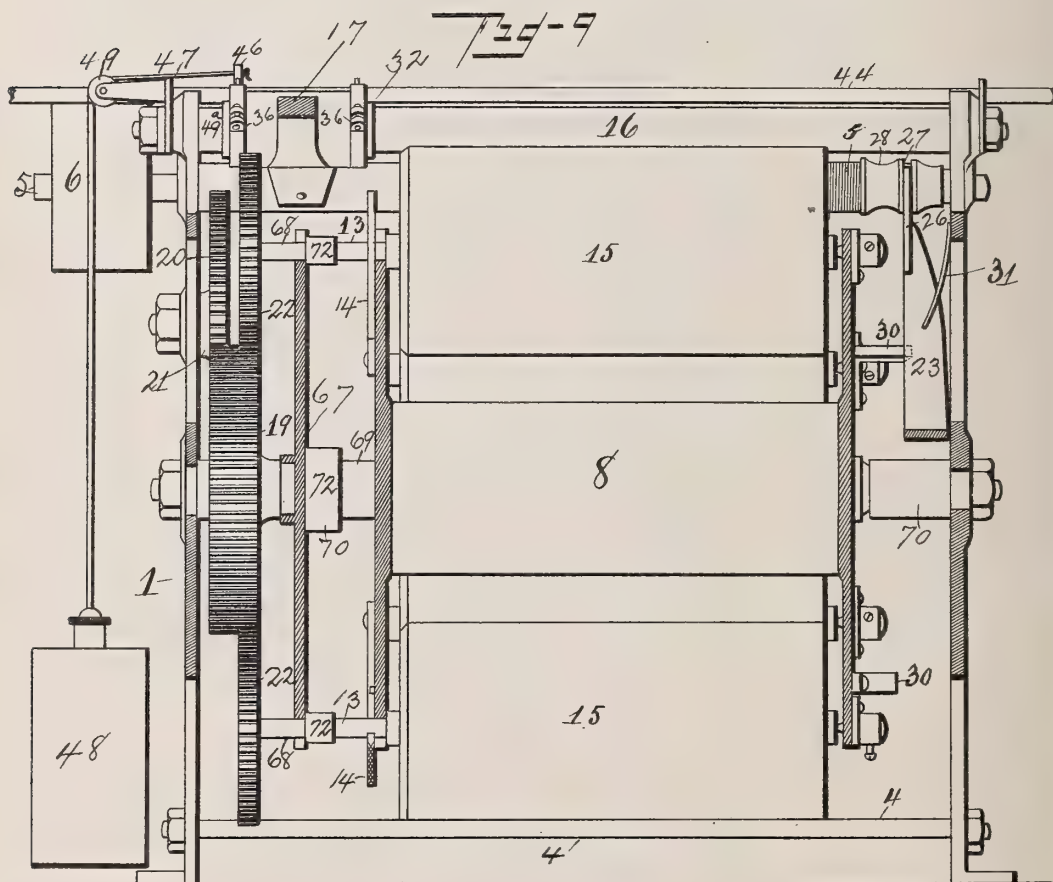
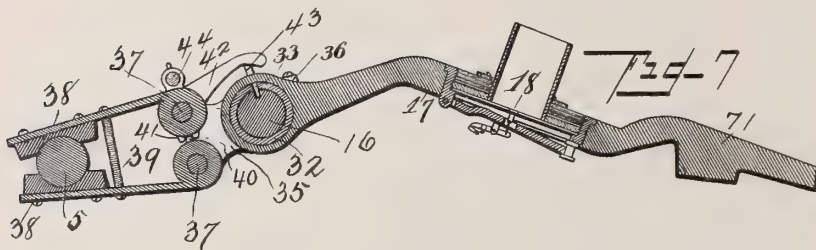
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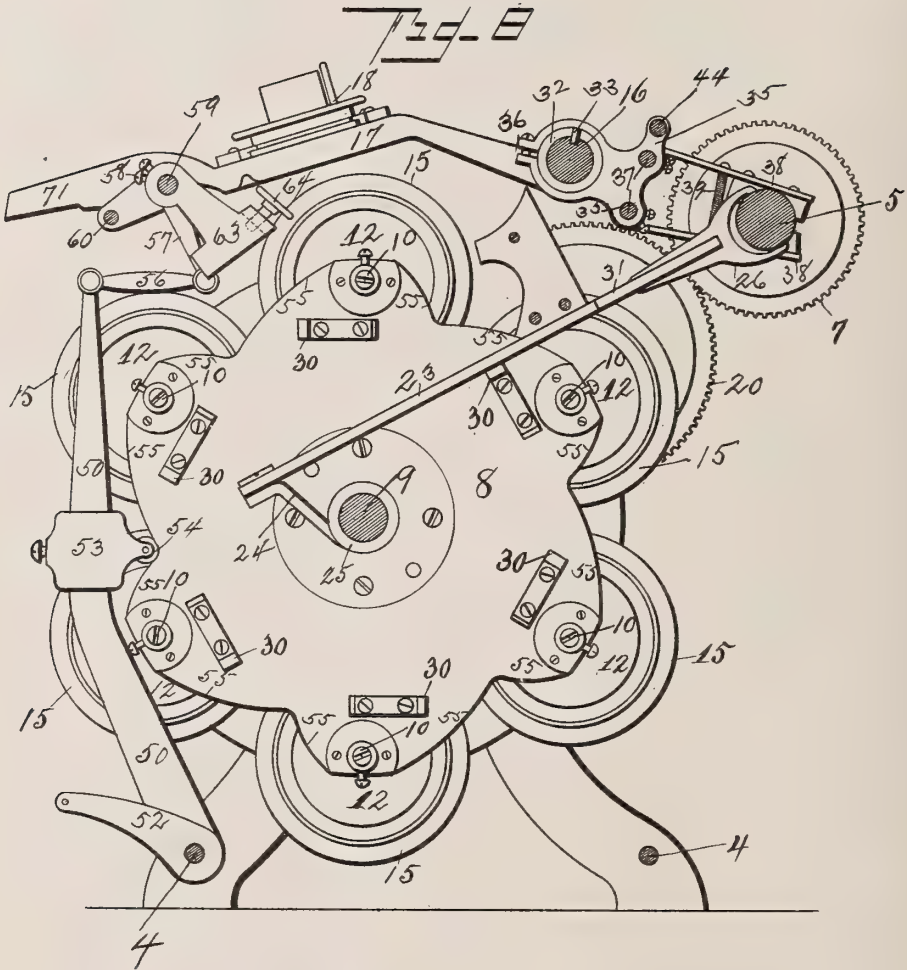
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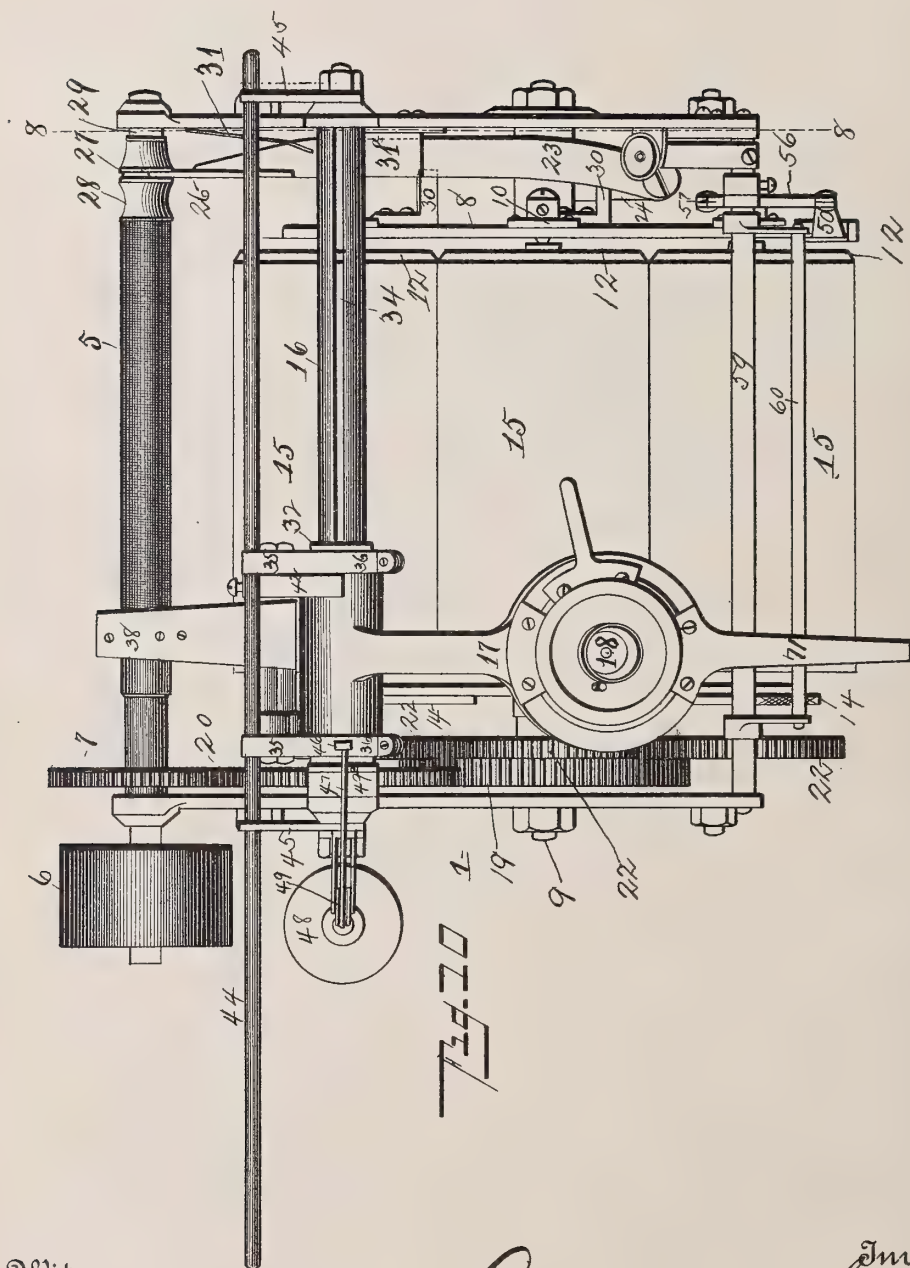
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Witnesses

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Inventor

Joseph L. Atkins

UNITED STATES PATENT OFFICE.

JOSEPH L. ATKINS, OF WASHINGTON, DISTRICT OF COLUMBIA.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 495,869, dated April 18, 1893.

Application filed August 27, 1892. Serial No. 444,287. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. ATKINS, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to produce a talking machine that is practically continuous in its operation for receiving and repeating a speech or discourse of indefinite length, and operating automatically and without attention or manipulation of any sort.

Incidentally to the carrying out of my object I have also produced certain preferred forms of mechanism which will be hereinafter fully illustrated and described, and succinctly set forth in the appended claims.

In the accompanying drawings, Figure 1 is a perspective view, taken from the front of my machine. Fig. 2 is a rear elevation thereof. Fig. 3 is a side elevation; and Fig. 4 a similar view, taken from the opposite side. Fig. 5 is a view of one side of the loaded magazine, detached; Fig. 6 a similar view of the other side. Fig. 7 is a sectional view of the diaphragm carrier and the mechanism for operating it. Fig. 8 is a vertical sectional view, on the line 8, 8 of Fig. 10. Fig. 9 is a vertical section of a modification of my machine and Fig. 10 a top plan view of the machine shown in Fig. 1.

Referring to the figures on the drawings, 1 indicates a suitable frame, which may be constructed in any desirable manner; but preferably, as I now consider it, of end plates 2 and 3 and connecting bolts or rods 4.

5 indicates an endless screw journaled in suitable bearings in the end plates, and adapted to be driven as from a pulley 6. It is well known in the art that the time of rotation of the screw which imparts motion to the diaphragm should be regulated with respect to the tablet. For the purpose, therefore, of operatively connecting the screw with the tablet, I provide upon the screw a fixed gear 7.

Since the object of my invention is to produce a continuously operative machine, I find it essential to provide mechanism for automatically displacing a completely inscribed or transcribed tablet; and also mechanism for replacing another tablet for inscription or

transcription, as the case may be. It is not only essential that these mechanisms should be employed, but also that they should act conjointly not only in displacing and replacing a tablet, respectively, but that both displacing and replacing mechanisms should properly take care of their respective tablets after each operation.

As at present constructed talking machines are provided with exceedingly fragile tablets, and it is necessary that the displacing and replacing mechanisms should support them at all times without friction, shock, or jar. In consideration of the conditions aforesaid I have preferred to adopt a cylindrical frame or magazine 8, which is loosely mounted upon a journal 9, secured to the side plates of the frame. This element, which I have termed a magazine comprehends, in addition to the office denoted by that term, in combination with its correlated driving parts, tablet-displacing and tablet-replacing mechanism; and therefore I wish clearly to define what I mean by these terms.

The magazine carries in suitable bearings 10 and 11; tablet carriers 12, preferably round and revoluble and individually provided with shafts 13. Each of the bearings is provided with a suitable, spring-actuated catch 14, for removably securing the carrier shaft.

The tablet-carriers, in their present preferred forms as above suggested, are preferably tapered, and each is adapted to carry an internally tapered tablet 15.

Inasmuch as the cylindrical frame, loaded with its carriers and tablets, is at all times provided with a plurality of tablets, it may be properly designated as a magazine; and in that term I comprehend broadly all forms of mechanism for carrying a plurality of tablets, with or without separate tablet carriers.

16 indicates a fixed guide-rod carried in the end plates of the frame, and carrying thereon a movable diaphragm carrier 17, within which is mounted a sound receiver as for example a diaphragm 18, which diaphragm may be of any suitable and ordinary construction and provided with a flexible conveyer 18^a; and preferably provided with usual mechanism for adapting it to the purposes of inscription or transcription.

By the terms inscription and transcription,

respectively, which, for the sake of brevity I have employed, I mean the recording upon the tablet of sound waves, or the reproduction of recorded sound waves.

5 The diaphragm is in practice, as usual, carried in operative proximity to one of the tablets. As usual, the relative positions of the tablet and the diaphragm are caused gradually to change, so that preferably the stylus
10 of the diaphragm follows a spiral course around the tablet until it shall have covered the surface thereof. It is obvious, and is well understood in the art that the relative change of positions of those parts may be gained
15 either by the motion of the diaphragm, or the motion of the tablet. In the present embodiment of my invention I prefer to make the diaphragm movable endwise of the tablet.

Referring particularly to the illustrated
20 form of my machine, by my invention I cause the automatic displacement of a completely covered tablet, and the replacement of a new one. It will, therefore, appear that the cylindrical magazine herein illustrated and described, when in operation, resolves itself into
25 displacing and replacing mechanism, and in this connection performs two separate and distinct offices, namely, of removing a covered tablet and of presenting a new tablet in front
30 of the diaphragm. I wish to make this distinction perfectly clear, because, although for the reasons above stated I prefer a cylindrical magazine, and one which incidentally combines within itself, when in operation, a tablet-receiving and tablet-displacing mechanism, I do not wish to be understood as confining
35 myself to such continuous form of magazine, or to the very close and intimate relationship between the replacing and displacing mechanisms arising out of the use of such a magazine. In addition to the reasons as set forth for my preference toward a cylindrical
40 magazine, I consider it as productive of the best results to provide for the simultaneous synchronous rotation of all the tablets carried at one time in the magazine, or, at least of the one which is being operated upon by the diaphragm, and of the one which is about
45 to be brought into requisition to insure a similarity of effects upon each of the tablets as they are successively operated. Suitable mechanism for accomplishing this result is shown in the drawings, in which 19 indicates a gear secured to the magazine and revolvably
50 with it upon its shaft.

20 indicates an idle-wheel carried upon a stud 21 in one of the side plates of the frame, and adapted to communicate motion from the screw-gear 7 to the magazine-gear 19. Each
60 tablet-carrier shaft is provided with a gear 22, meshing with the gear 19. Power transmitted from the screw-gear 7 tends by this arrangement to rotate the magazine upon its axis, and to impart synchronous rotation to each
65 of the tablet-carriers. In practice, however, the resistance of the load of the tablet car-

riers upon the gear 19 being greater than the opposition to its rotation upon its shaft, the effect of the arrangement shown would be, without obstruction, to drive the magazine
70 cylinder upon its axis without imparting motion to the tablet-carriers. By overweighting the magazine cylinder, however, the motion may be transferred from the former to the latter. For this purpose in this instance for
75 example I employ an arm 23, pivotally carried upon a projection 24, extending from a collar 25 carried upon the magazine cylinder journal 9. Its loose end is preferably bifurcated, as indicated at 26, and engages on opposite
80 sides with an annular groove 27 in a sliding collar 28 upon a smooth bearing 29 at the extremity of the endless screw 5.

30 indicates lugs suitably located, respectively, in proximity to each of the tablet carriers, upon the side of the magazine cylinder, and projecting outwardly in the direction of the arm. When the sliding-collar is moved toward the magazine, the arm is brought into the path of the lugs, and when the sliding-
90 collar is moved against the side plate of the frame, the arm is out of reach of the lugs. A spring 31 carried in the arm and impinging against the side plate tends to keep the arm normally set in the path of the lugs.
95

31^a indicates a brace secured to the side plate, nearly opposite the place at which the lugs strike the arm, and is adapted to render it rigid.

From the foregoing description it will be
100 perceived that when the arm is in its normal position, as actuated by its spring, the magazine may be driven until one of its lugs strikes against the arm. Thereupon the rotation of the magazine upon its axis will be
105 stayed, and motion will be imparted to the tablet-carriers, which will continue to revolve under the application of the driving power until the magazine shall have been released. The proper location of the lugs 30 upon the
110 side of the magazine is, as illustrated, such as to bring the tablet in advance of the retaining lug into operative relations with the diaphragm.

32 indicates a sleeve provided with a key
115 33 that keys into a longitudinal groove 34 in the guide-rod 16, and renders it revolvably fixed, but longitudinally movable thereon.

35 indicates supports secured to the sleeve in any suitable manner, as for example by
120 split collars 36. These collars serve to hold the oscillatory diaphragm-carrier 17 firmly.

37 indicates pins in the upper and lower parts of the projections.

38 indicates internally screw-threaded jaws
125 that are fastened to the pins and pivoted thereby to the projections. The screw-threaded ends of these jaws are adapted to fit upon the threads of the endless-screw 5, and to be operated thereby when closed upon it; or to be released therefrom by the opening of the
130 jaws.

39 indicates an expansible spring which tends to keep the jaws separated from the screw.

Referring to Fig. 7 40 indicates a mutilated gear secured to one of the pins; and 41 indicates a similar gear secured to the other pin, preferably the upper one. The mutilated gear 41 is provided with a projection 42, by which both the mutilated gears may be operated to work the jaws. By the force of the spring 39 the jaws will be normally kept open out of engagement with the screw. For that reason I provide a lug 43 upon the hub of the diaphragm-carrier 17, which serves to close the jaws and keep them locked upon the screw when the diaphragm-carrier is in its normal position for use.

44 indicates an auxiliary guide-rod secured to the projection 36, and movable in suitable bearings 45 upon the sides of the frame. The purpose of this auxiliary guide-rod is to impart smoothness of movement to the diaphragm-carrier sleeve 32 upon its rod.

46 indicates a lug connected with the diaphragm-carrier, and fastened to a cord 47, in the lower end of which is provided a weight 48. The cord is passed over pulley 49 secured to the side of the frame.

The entire mechanism may be designated as counterweight mechanism, and may be of any suitable and ordinary construction, its purpose being to restore the diaphragm-carrier to its original starting point when it shall have completed its travel and shall have been released from the screw 5.

49^a indicates a suitable cushion around the guide-rod 16, which is adapted to receive the impact of the diaphragm-carrier at the end of its backward movement.

It will be understood from the foregoing description that the diaphragm-carrier, operated by the endless-screw 5, is caused to travel entirely across the face of one of the tablets. As it reaches the end of its travel the sides of the jaws 38 impinge against the sliding-collar 28, and move it upon its bearing toward the side of the frame, thereby moving the arm 23 out of the path of the lugs 30. Immediately thereupon the driving power of the machine operates as above explained to rotate the magazine upon its journal; and by the co-operation of suitable tripping mechanism the diaphragm-carrier will be instantaneously restored by its counterweight mechanism to its original position.

In the drawings I have shown a suitable form of tripping mechanism, which consists of a lever 50 pivoted to the lower front rod 4, and spring-actuated, as by a spring 51 fastened to the side plate of the frame, and to a projection 52 extending from the hub of the lever. This spring urges the lever toward the end of the magazine cylinder, against the edge of which the lever rides. For this purpose it is provided with an adjustable housing 53 that carries an anti-friction roller 54. This end of the magazine cylinder is provided

with a suitably curved cam surface 55 for each tablet carrier.

56 indicates a pitman pivoted at one end to the lever 50, and at its opposite end to a crank 57 that is secured as by a set-screw 58 to a rock-shaft 59 pivoted in the side plates of the frame.

60 indicates a diaphragm-carrier support, which is also securely fastened to the rock-shaft by a screw 61, preferably employed for the purposes of adjustment.

71 indicates a projection upon the end of the diaphragm-carrier, which extends outwardly and downwardly so as to reach and ride upon the support, and by which the diaphragm-carrier may be lifted in the ordinary manner in any part of its travel, it having been already explained that the lifting of the diaphragm-carrier separates it from the endless screw which drives it.

By the operation of the spring 51 the lever 50 will be kept pressed against the edge of the magazine cylinder end, which will draw the diaphragm-carrier support out of the way of the diaphragm-carrier and allow it to work freely over the face of the tablet. When the diaphragm-carrier, however, has reached the end of its travel and has moved the arm 23 out of the way of the lugs 30, and the driving power, as above explained, has been rendered effective for rotating the magazine cylinder upon its axis, the lever 50 riding upon the cam surface of the end of the magazine cylinder will be operated, and will instantaneously lift the diaphragm-carrier from the face of the tablet, separating the jaws and releasing them from the screw. At the same instant the counterweight mechanism will restore the diaphragm-carrier to its position. Then the magazine cylinder will have completed the portion of its revolution between the adjacent lugs 30, and the mechanism will be thereby restored to its former position. The weight of the diaphragm is ordinarily sufficient for closing the jaws upon the end of the screw; but other means may be employed for insuring that result, if preferred. The diaphragm-carrier may ride upon the support 60 in its travel backward and forward; and for that purpose I employ a projection 63 secured to the rock-shaft, and a set-screw 64 working in a projection 65 extending in the path of the former projection from the side plate of the frame. By this means the position of the diaphragm-carrier and its connected parts may be regulated to a nicety.

Where a diaphragm that is adapted for the work of both inscribing and transcribing is employed, it is necessary to provide for a difference in the travel of the diaphragm-carrier when inscribing and when transcribing. For that purpose a removable collar 66 in juxtaposition to the sliding collar 28 might be employed, (see Fig. 2.)

In Fig. 9 of the drawings I have illustrated convenient means for removing the magazine from the frame. Referring to that figure 67

indicates a bearing plate in which are permanently carried upon suitable journals 68 the tablet-carrier gears 22. The magazine is made substantially as before described, except that it is provided with its proper shaft 69 adapted to be set into bearings 70 concentric with the gear 19. The opposite ends of the journals 68 and of the tablet-carrier shafts 13, as well as the magazine shaft 69 and the center of the gear plate 67 are provided with suitable simple clutch devices 72. The effect of the device illustrated in Fig. 9 is substantially as above described, except that the magazine may be readily removed from its bearing. In this way it is unnecessary to manipulate the tablets after having once adjusted them; but the magazines may be shifted from one machine to another, and each magazine rendered in effect a single tablet to be used in the same manner as the ordinary tablet is now used.

It is apparent that the size of the magazine cylinder is immaterial to my invention. The cylindrical magazine is in effect an endless conveyer, and it is immaterial whether it is made with solid sides, or with flexible sides.

The operation of my device is as follows: Suppose power to be applied to the pulley 6, motion will be immediately imparted to the diaphragm-carrier and to the tablet-carrier in juxtaposition thereto. The operation of the machine and the method of using it will be substantially the same as in the ordinary phonograph until the diaphragm-carrier shall have nearly completed its travel across the face of the tablet. At this time the jaws begin to press against the sliding-collar 28 and finally release the arm 23. Thereupon the cylinder magazine will be released, and will begin its rotation upon its axis. Immediately the lever 50 will operate the diaphragm-support and lift the diaphragm. By the act of lifting the diaphragm the jaws will be opened and the counterweight mechanism will instantaneously restore the diaphragm-carrier to its original position against the end-plate 2. As soon as the diaphragm-carrier is released the arm 23 will be restored by its spring to its original position, so that by the time the diaphragm-carrier shall have reached its initial position, the magazine cylinder will have completed its allotted rotary movement, and will be set by the impingement of the lug 30 against the arm. The lever 50 in the meantime having followed its cam will have lowered the diaphragm-carrier support, so that the diaphragm-carrier will have descended, closed the jaws, and recommenced its travel across the face of the replaced tablet.

While the several movements of my machine may not be instantaneously explained, the entire operation, as above set forth, has been found in practice to be but momentary. The time necessary for the complete shift from one cylinder to another is not so long as would be required to articulate an ordi-

nary three syllable word. Consequently in practice not more than one word of ordinary length could be lost, the connection could never escape, and in ordinary use not so much as the loss of a single word would occur.

I desire it to be distinctly understood that I do not limit myself in any respect to any of the details of construction or arrangement herein set forth; but reserve to myself the right to modify them for the purpose of producing any more desirable mechanical embodiment of my ideas within the scope of my invention.

What I claim is—

1. In a talking-machine, the combination with a frame, sound-receiver, and driving mechanism, of a plurality of tablets, and mechanism operatively connected with the driving mechanism for automatically bringing each of the tablets successively into operative relations with the receiver, substantially as set forth.

2. In a talking machine, the combination with a frame, sound receiver, and driving-mechanism, of mechanism connected with the driving-mechanism for automatically bringing each of the tablets successively into operative relations with the receiver, and mechanism also connected with the driving mechanism for automatically displacing and carrying each of said tablets after it shall have been used, substantially as set forth.

3. In a talking machine the combination with a frame, sound receiver, and driving mechanism, of a tablet magazine, and intermittently operating mechanism connected with the driving mechanism for presenting an individual tablet to the receiver at regular intervals, substantially as set forth.

4. In a talking-machine, the combination with a frame, sound receiver, and driving mechanism, of a tablet magazine, intermittently-operating mechanism connected with the driving mechanism for presenting a tablet to the receiver at regular intervals, and mechanism also connected with the driving mechanism for carrying each completed tablet as it makes way for the next succeeding one, substantially as set forth.

5. In a talking-machine, the combination with a frame, sound receiver, and driving mechanism, of a tablet magazine, intermittently-operating mechanism connected with the driving mechanism for presenting an individual tablet to the receiver at regular intervals, and mechanism also connected with the driving mechanism for carrying and supporting each discharged tablet to prevent its injury, substantially as set forth.

6. In a talking-machine, the combination with a frame, tablet magazine, and sound receiver, of continuously-operating driving mechanism for changing the relations of the receiver with respect to each individual tablet, and intermittently-acting mechanism connected with the driving mechanism for operating the magazine to present successively a

new tablet to the receiver at regular intervals, substantially as set forth.

7. In a talking machine, the combination with a frame, driving mechanism and sound receiver connected therewith, of automatic tablet displacing and replacing mechanism also connected with the driving mechanism, substantially as set forth.

8. In a talking machine, the combination with a frame, a sound receiver and mechanism for alternately moving the receiver in opposite directions, of a tablet magazine and intermittently-acting magazine operating mechanism, substantially as set forth.

9. In a talking-machine, the combination with a frame and automatic alternately-reciprocatory sound receiver, of tablet displacing and replacing mechanism co-operatively and automatically connected with the driving-mechanism, substantially as set forth.

10. In a talking-machine, the combination with a frame, driving mechanism, and automatic alternately-reciprocatory sound receiver, of tablet displacing and replacing mechanism connected with the driving mechanism, and receiver elevating mechanism also connected with the driving mechanism, substantially as set forth.

11. In a talking machine, the combination with a frame, driving mechanism and sound receiver, of a tablet magazine, mechanism for operating the same, and mechanism for imparting synchronous rotation to a plurality of the tablets at the same time, substantially as and for the purpose specified.

12. In a talking machine, the combination with a frame and driving mechanism, of a sound receiver, a tablet magazine, and a plurality of synchronously rotatory tablet carriers, therein, substantially as set forth.

13. In a talking machine, the combination with a frame and driving mechanism, of an automatically continuously operative sound receiver, an intermittently operative magazine and a plurality of synchronously rotatory tablet carriers, substantially as set forth.

14. In a talking machine, the combination with a frame, driving mechanism and sound receiver operatively connected with the driving mechanism, of a tablet magazine and a plurality of synchronously rotatory tablet carriers also operatively connected with the driving mechanism, substantially as set forth.

15. In a talking-machine, the combination with a frame and driving mechanism, of an automatic alternately-reciprocatory sound receiver and an automatic intermittently operative cylindrical magazine connected with the driving mechanism, and a plurality of tablet carriers also connected with the driving mechanism, substantially as set forth.

16. In a talking machine, the combination with a frame, driving mechanism and automatically alternately reciprocatory sound receiver, of a cylindrical tablet magazine, and a plurality of synchronously rotatory tablet carriers thereon, substantially as set forth.

17. In a talking machine, the combination with a frame and driving mechanism, of an automatically alternately reciprocatory sound receiver, and an automatic intermittently operating cylindrical tablet magazine, and a plurality of tablet carriers thereon, substantially as set forth.

18. In a talking machine, the combination with a frame, sound receiver, and driving mechanism, of a tablet magazine and arm engaging with the tablet magazine to normally stay it, said arm located in the path of the sound receiver to be operated thereby, substantially as set forth.

19. In a talking-machine the combination with a frame, driving mechanism tablet magazine and counterweighted sound-receiver, of rotatory tablet-carriers in the magazine connected with the driving mechanism, mechanism also connected with the driving mechanism for automatically imparting motion to the magazine and to the tablet-carriers at intervals, respectively, and co-operative mechanism for raising and lowering the sound receiver away from or toward the tablet carriers, substantially as set forth.

20. In a talking-machine, the combination with a frame and driving mechanism, of a rotatory tablet magazine, a fixed gear thereon connected with the driving mechanism, rotatory tablet carriers carried by the magazine in operative relation to the carrier, and means connected with the driving mechanism for automatically staying the rotation of the magazine and transferring motion to the tablet-carriers, and vice-versa, substantially as set forth.

21. In a talking machine, the combination with a frame sound receiver driving screw and intermediate sound receiver support and irrevolvable sound receiver carrier, a screw-jaw pivotally carried upon the carrier and oppositely extending projection connected with the screw-jaw, and a lug upon the sound receiver adapted to engage with said projection to operate the jaw, substantially as and for the purpose specified.

22. In a talking machine, the combination with a frame and driving mechanism, of a rotatory magazine and gear connected therewith and with the driving mechanism and tablet carriers upon the magazine operatively connected with the gear, a reciprocatory sound receiver, a movable arm in the path of the sound receiver adapted to normally stay the motion of the magazine and to be released by the motion of the sound receiver, cams upon the magazine, and a lever adapted to be operated thereby, and a movable sound receiver carrier support connected with the lever, all to operate substantially in the manner and for the purpose specified.

23. In a talking machine, the combination with a frame, and driving mechanism, of a rotatory tablet magazine, a fixed gear thereon connected with the driving mechanism, rotatory tablet carriers carried by the magazine in operative relations with the gear, and an

automatically operative mechanism for alternately staying the rotation of the magazine or releasing it for the purpose of imparting motion to the tablet carriers, respectively, substantially as set forth.

24. In a talking-machine, the combination with a frame, driving mechanism, counter-weighted sound receiver, tablet magazine and rotatory tablet carriers in the magazine, of mechanism for imparting motion to the magazine, adapted thereby to raise and lower the sound receiver from or toward the tablet-carriers, substantially as set forth.

25. In a talking-machine, the combination with a frame, driving mechanism, counter-

weighted sound receiver, tablet magazine, and rotatory carriers in the magazine, of means for imparting motion to the magazine and mechanism co-operating with said means and connected with the driving mechanism to release the sound receiver and raise and lower the sound receiver away from or toward the tablet carriers, substantially as and for the purpose specified.

In testimony of all which I have hereunto subscribed my name.

JOSEPH L. ATKINS.

Witnesses:

C. P. ELWELL,

LOUIS G. JULIHN.

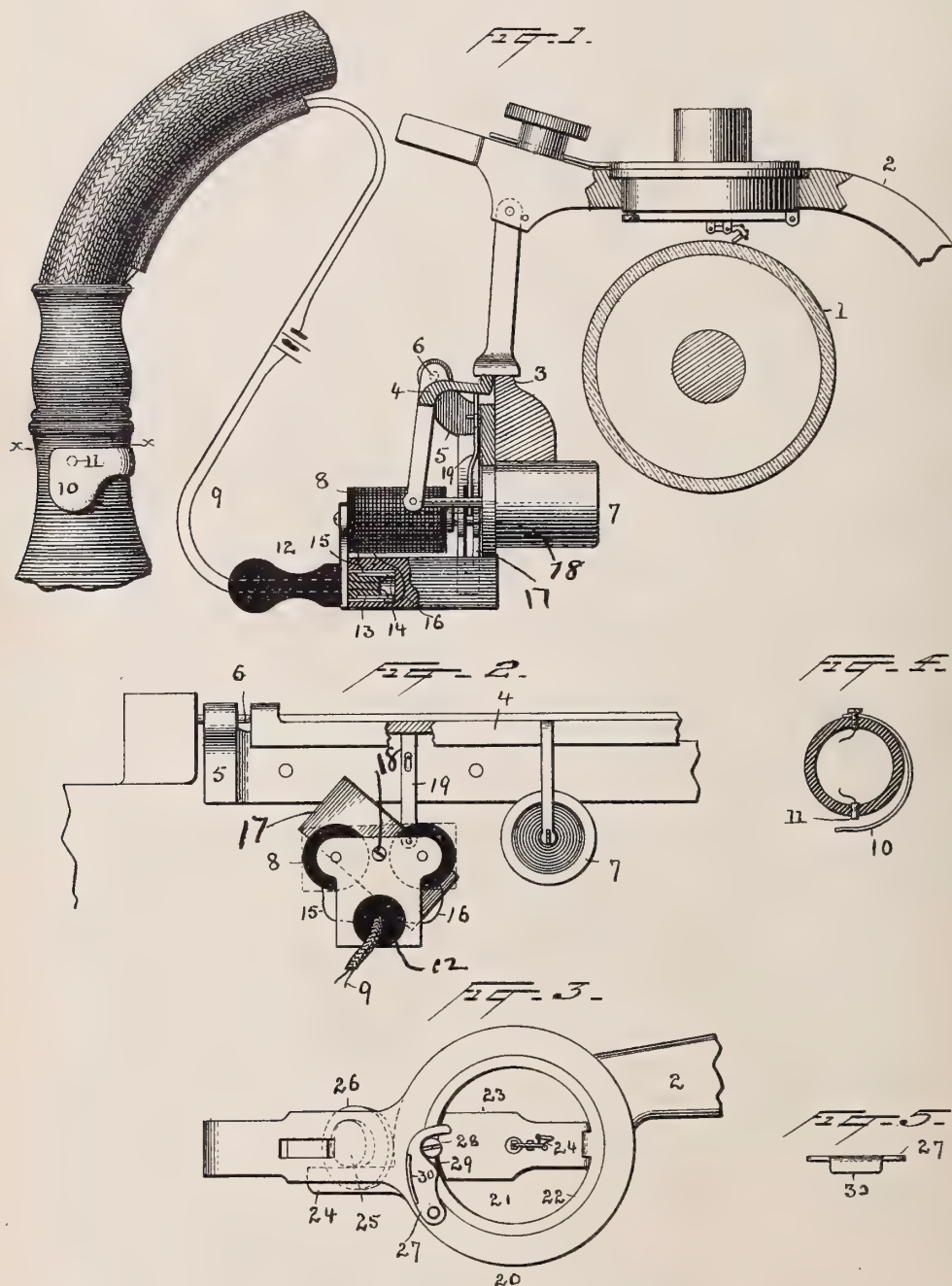


(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 496,191.

Patented Apr. 25, 1893.



Witnesses
Morris A. Clark,
W. F. Oberly.

Inventor
T. A. Edison
By his Attorneys
Dyer & Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 496,191, dated April 25, 1893.

Application filed February 9, 1891. Serial No. 380,712. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 907,) of which the following is a specification.

The objects of this invention are to enable the user of the phonograph to stop or start the recorder while in the act of speaking into the phonograph without moving the feed arm to or from the feed screw by the hand, and without opening the motor circuit, as has heretofore been necessary, and to control the position of the recorder and reproducer while turning off the surface of a blank, as hereinafter set forth.

In the accompanying drawings which illustrate the improvement, Figure 1 is a view showing the recorder resting on a phonogram blank, a section of the speaking tube and the mechanism for raising the recorder from the blank. Fig. 2 is a face view of a portion of the devices shown in Fig. 1. Fig. 3 is a view of the recorder and reproducer looking from the under side. Fig. 4 is a section on line *xx* of Fig. 1, and shows the circuit controller; and Fig. 5 is a side view of one of the parts shown in Fig. 3.

The phonogram blank 1 is mounted on a cylinder which is revolved in the ordinary or any suitable manner. The rocking holding arm 2 which supports the recorder and reproducer is connected with a guide sleeve, which sleeve has a feed arm engaging with a feed-screw in the usual or any suitable manner not necessary to be illustrated in this case. Near one end of the arm 2 is attached the presser foot adapted to bear on and move along the guide rest 3.

4 is a tilting bar pivoted at each end to a suitable support or bracket as indicated at 6.

7 is a dash pot connected with the tilting bar to steady and regulate the movement of said bar. Below the tilting bar, supported in any suitable manner, is an electro magnet 8 included in a circuit 9 extending to a circuit controller on the speaking tube in a position convenient to be operated by the hand which holds said tube to the mouth. The circuit controller in the form illustrated consists of

a spring 10 connected to one wire of the circuit and a pin 11 connected to the other wire of the circuit. These wires terminate in a plug 12 having two conducting plates 13, 13, adapted to make contact with two corresponding plates in the socket into which the plug is inserted. The two socket plates are connected respectively to the two terminals 15, 16, of the magnet, as indicated in Figs. 1 and 2.

17 is an armature for the magnet and has a centrally located pivot 18. This armature is connected by means of a link or rod 19 with the tilting bar 4. The upper end of 19 preferably merely rests against said bar, although it may have a pivotal connection. When the circuit is open the weight of the recorder arm resting on the tilting bar is sufficient to depress the tilting bar and armature into the position shown in Figs. 1 and 2, but when the circuit is closed by pressure on the spring 10, the armature 17 is caused to turn on its pivot taking the position shown in dotted lines in Fig. 2, thereby raising the inner edge of the tilting bar and moving the recorder from the phonogram blank. It will be understood that this motion also disengages the feeding device of the phonograph. When the operator desires to proceed with his dictation, he removes his finger from the spring 10 allowing the circuit to open, and the parts resume their normal position. A battery is shown in the circuit 9 but in practice a branch from the motor battery will ordinarily be used.

In using the phonograph after a record has been made on the blank, it is often desired to remove said record in order that the blank may be again used. In some phonographs the mechanism is so arranged that the old record can be cut off and a second record made on the blank just behind the cutting off tool, but in certain other phonographs the entire surface must be cut off before the second record is made on the blank. In this form of phonograph I find it very desirable that the recorder and reproducer should be raised entirely away from the surface of the blank during the operation of cutting off the old record. I therefore provide a support for the plate on which the recorder and reproducer are mounted. As illustrated in Fig. 3, the rocking holding arm 2 terminates in a ring 20 which carries the diaphragm 21 and dia-

phragm support 22. To this support is pivoted a plate 23 which carries the recorder and reproducer 24 arranged in a well-known manner, so that when in one position the recorder 5 bears on the phonogram blank, and when in another position the reproducer bears on said blank.

24 is an arm connected with 22, and 25 is a cam which can be moved by the milled head 10 26 for moving the arm 24 to adjust the position of the reproducer onto the line of record.

27 is a plate, preferably struck up from a piece of sheet metal, pivoted at one end to the ring 20. The opposite end is adapted to 15 project under the plate 23.

28 is a screw or pin projecting from 22 and movable therewith when the diaphragm and diaphragm support are turned to change the position of the recorder and reproducer. Plate 20 27 is provided with a cam surface 29 against which 28 bears as it is moved in the manner above described. Plate 27 is provided with a downward projection 30 to serve as a handle for moving the plate in one direction.

25 The operation of the device just described is as follows: In the position shown in Fig. 3 the diaphragm is supposed to be turned to bring the reproducer over the bearing surface of the phonogram blank. The plate 27 is, 30 however, pushed inward so that its end rests under the plate 23 and supports it so that the reproducing point does not actually touch the blank. This is the position occupied during the cutting off of an old record. When 35 said operation has been completed the arm 24 is moved away from the cam 25 thereby turning the diaphragm and its support and moving pin 28 against the cam surface 29, thereby automatically withdrawing the end of plate 40 27 and allowing plate 23 to descend so that the recorder shall rest on the surface of the blank. To again move the plate 27 under 23 the extension 30 is pressed by the finger of the operator, since the pin 28 does not operate 45 on the cam surface in its reverse movement.

Having thus described the invention, what I claim is—

1. In a phonograph, the combination with the rocking holding arm, the guide rest there- 50 for, and the tilting bar, of an electro-magnet controlling the position of the tilting bar, a circuit including said magnet, and a circuit

controller in said circuit, substantially as set forth.

2. In a phonograph, the combination with 55 the rocking holding arm, the guide rest therefor, and the tilting bar, of an electro-magnet, a movable armature therefor, a mechanical connection between said armature and said tilting bar, a circuit including said magnet, 60 and a circuit controller in said circuit, substantially as set forth.

3. The combination, in a phonograph, of a recorder and reproducer carried by a single support, which support can be turned to bring 65 either the recorder or reproducer into operative position, a movable plate adjacent to said support and projecting or adapted to project under it, and a pin movable with the support and pressing against said plate to move it, 70 substantially as described.

4. The combination in a phonograph, of a recorder and reproducer carried by a single support, which support can be turned to bring 75 either the recorder or reproducer into operative position, a movable plate having a cam surface and adapted to project under the recorder and reproducer support, and a pin movable with said support and pressing against said cam surface to move the plate, 80 substantially as described.

5. The combination of a plate supporting a phonograph recorder or reproducer, or both, a movable ring upon which the plate is supported, a pin movable with the ring, and a 85 pivoted plate adapted to extend under the recorder support having a cam face against which the pin bears to move the plate, substantially as described.

6. The combination of a plate supporting a 90 phonograph recorder or reproducer, or both, a movable ring upon which the plate is supported, a pin movable with the ring, and a pivoted plate adapted to extend under the recorder support having a cam face against 95 which the pin bears to move the plate in one direction, and a handle for moving it in the reverse direction, substantially as described.

This specification signed and witnessed this 4th day of February, 1891.

THOS. A. EDISON.

Witnesses:

E. J. BERGGREN,
L. O. WEBER.

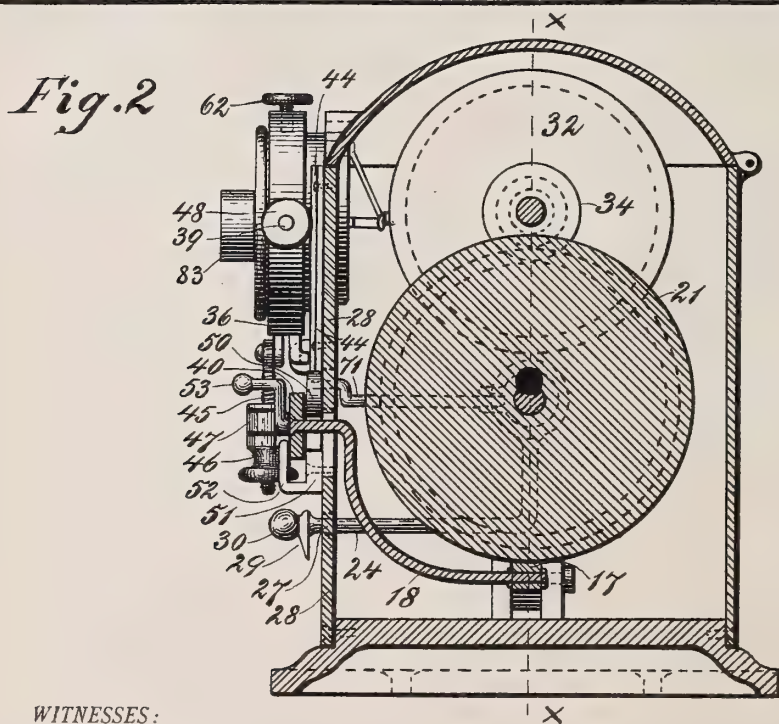
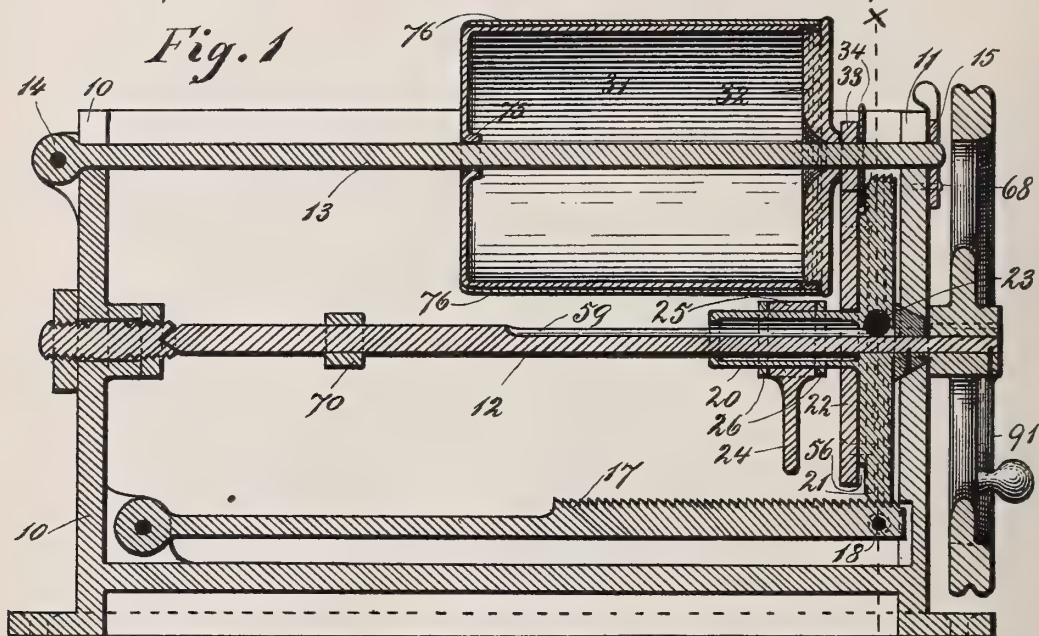
(No Model.)

2 Sheets—Sheet 1.

W. BRUENING.
PHONOGRAPH.

No. 499,370.

Patented June 13, 1893



WITNESSES:

W. H. Newton

Charles S. Williams

INVENTOR

William Bruening

(No Model.)

2 Sheets—Sheet 2.

W. BRUENING.
PHONOGRAPH.

No. 499,370.

Patented June 13, 1893.

Fig. 3.

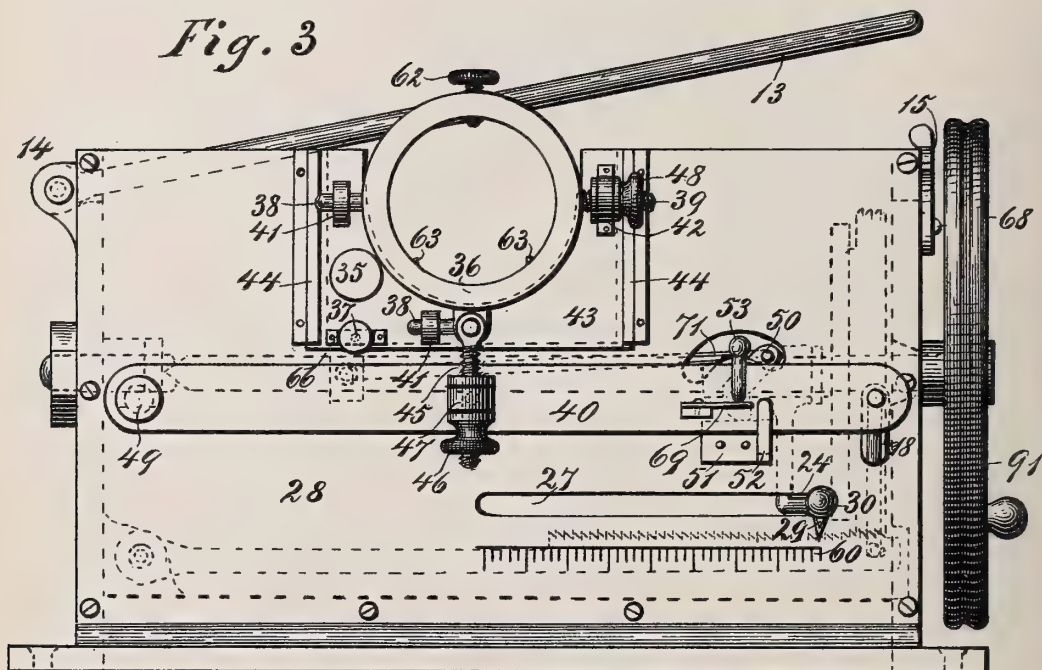


Fig. 4.

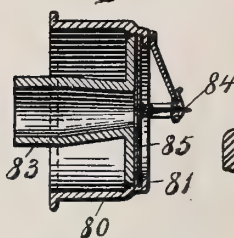
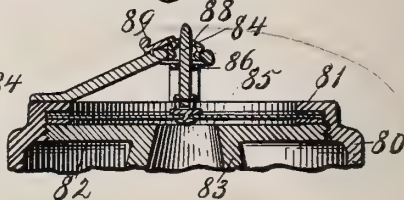


Fig. 6.

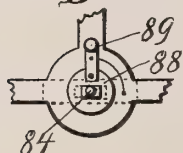


WITNESSES:

W. R. Newton

Charles S. Williams

Fig. 5.



INVENTOR

William Bruening

UNITED STATES PATENT OFFICE.

WILLIAM BRUENING, OF EAST ORANGE, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 499,370, dated June 13, 1893.

Application filed March 25, 1892. Serial No. 426,623. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRUENING, a citizen of the United States, residing in the township of East Orange, county of Essex, and State of New Jersey, have invented new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to improvements in phonographs and has for its object to provide a cheap and efficient mechanism for general use and consists principally in the following improvements:

A tablet of new and convenient shape is used which is self-sustaining by having one or more axial bearings or perforated hubs permanently attached thereto and which revolves spirally on a fixed rod or bar and is provided with recording material adapted to receive a durable record.

The invention further comprises certain special constructions, combinations and arrangements of parts as hereinafter set forth.

In the accompanying two sheets of drawings which form part of this specification, Figure 1, is a central vertical section of the mechanism. Fig. 2, is a vertical cross-section on the line *x x*, of Fig. 1, partly in elevation and with the style in position for reproducing. Fig. 3, is a front elevation with the recorder and tablet removed and the fixed rod or bar released and tilted. Fig. 4, is a central sectional view of the recorder (or reproducer). Fig. 5, is an enlarged front view of the forward support of the style showing the movable button and its slot and the handpiece for turning the same. Fig. 6, is an enlarged sectional view of part of the recorder showing the manner of attaching and supporting the style and diaphragm.

Similar numerals refer to similar parts throughout the figures.

The frame of the machine consists of a base supporting at each end standard 10, and 11, to which is secured at the front and rear a plate 28, of metal or other suitable material and a removable cover. A shaft 12, is journaled in the standards 10, and 11, as shown in Fig. 1, one end tapering to a point and bearing in an adjustable screw in the standard 10, and the other end passes through the standard 11 and is journaled therein by an attached tapering collar and provided at its

end with a hand-wheel or other usual means for rotating the same. A smooth round bar or rod 13, is secured detachably to the standards 10, and 11, and is preferably hinged at one end 14 and secured at the other end by a locking device 15, and may be tilted to remove or slip on a tablet but is not capable of rotation. A rack 17, is hinged to the standard 10, near its base, parallel to the shaft 12, and held in position by a bar 18 suspended from the lever 40. A sleeve 20, movably encircles the shaft 12, and carries at one end a circular screwcut flange or wormwheel 21, and a gear 22, with an intermediate groove 56; the sleeve 20 is provided with an internal socket at any feasible point, preferably near the end which carries the wormwheel 21, and the shaft 12, is provided with a longitudinal groove; independent revolution of the sleeve on the shaft is prevented by a ball 23, preferably of steel, which is seated in the socket in the sleeve and engages with the groove on the shaft and permits the sleeve to move endwise thereon. The groove and socket and the ball engaging therewith take the place of a pin and slot whereby the friction is greatly decreased as the sleeve moves endwise on the revolving shaft. The arm 24, is attached at one end to the sleeve 20, by a collar 25, which is movably secured thereon by rings 26, and the other end extends through a slot 27 in the frame-plate 28 and a pointer 29 and a knob or handpiece 30 are attached thereto by which the sleeve 20 may be moved in either direction and by which also the tablet is moved in relation to the style so that any part of the tablet may be placed in operative position with the style.

The sliding frame may be of any usual construction and, as shown in Figs. 2, 3, and 4, consists of the annular frame 36 provided with pins 38 and 39 moving in blocks 41 and 42 fixed on the plate 43, which moves in vertical slides 44 attached to the frameplate 28; lateral motion is imparted to the frame 36 by turning the nut 48 which is movably held in the block 42 and engages with the threaded pin 39 attached to the frame 36, which holds the style with its attachments by means of the setscrew 62 and the projections 63.

The sliding frame is adjustably supported by the screw 45, which is pivoted with one of its ends on the frame 36, and works in a nut

46, which is movably secured on the lever 40, by a pivoted collar 47 attached thereto. The lever 40, consisting of a flat bar, is pivoted on the frameplate 28 by a pin 49 and is locked in position on the block 51, which is attached to the frameplate 28 and provided with a guard 52, by a movable cam 50 and its handpiece 53 attached to the lever; a spring 69 attached to the lever engages with a projection on the arm of the handpiece 53 to hold the lever in place but a spring catch or other suitable device may be used instead of the cam. A movable collar 70 on the shaft 12 is connected with the cam 50 by a pivoted rod 71 and the cam may be moved thereby to release the lever. A socket shown as an angular strip of metal 66, Fig. 3, is provided with a set-screw 37 and attached to the plate 43 of the sliding-frame to support a lamp and its adjustable holder, and the plate 43 is provided with an opening 35 for the insertion of the burner tube when using a heated style.

A scale 60, Fig. 3, is marked on the frameplate 28 near the edge of the slot 27 on which the pointer 29 indicates the position of the style on the tablet. The tablet 31, Fig. 1, may be a solid or hollow cylinder made of or coated with suitable recording material and have a longitudinal central opening for the passage of the fixed rod or bar 13 and a gear or flange or other suitable means removably or permanently attached to one of its heads by which it may be revolved, or a cylindrical tube may be provided with one or more perforated hubs or axial bearings; but I prefer to make it in the following manner: A sheet of metal is formed by drawing or other usual means into a cup with cylindrical sides and a central opening is made into the bottom or base the edges whereof are turned up to form a short tubular flange 75 as a bearing, or a bearing or perforated hub may be centrally attached to the base, or the cup may be made by casting in a suitable mold; the edge forming the mouth of the cup is trimmed and provided with an internal screwthread or other suitable means for removably attaching a cap or disk 32 thereto which is provided with a gear 33 and a flange 34 and a central opening fitting the fixed rod or bar 13; the removable cap 32 may therefore serve as an attachment for all tablets used in the machine. The cup 31 is coated by stopping its openings and dipping it into any suitable fluid or dissolved recording material, which in its normal condition is firm and may be fused or softened by heat; I prefer for this purpose, and thereby obtaining an entirely metallic tablet, an alloy consisting of about eight parts of bismuth, five parts of lead and three parts of tin, by weight, as having a low melting-point, but these proportions may be varied or other metals added or substituted; when the external surface of the cup has been coated with the alloy and the surplus thereof removed, which is done in a manner and by methods well known in the art of tinning, the cap 32 is at-

tached to the cup and the whole slipped on the rod or bar 13, which is tilted for the purpose, and moved thereon and therewith until the flange 34 engages with the groove 56 and the gear 33 with the gear 22, when the rod or bar 13 is locked on the frame by the hook 15, or other locking device.

In Figs. 4 and 6 a recorder is shown which may also be used as a reproducer; it consists of a cylindrical tube or thimble 80 which is bent inwardly at one end to form a narrow flange 81, upon which rests between washers of soft or yielding material the edge of a circular diaphragm 85 which is secured in place by the outwardly threaded flange 82 of a funnel or tapering tube 83 engaging with an internal screwthread on the thimble 80; the elongated style 84 is secured to the diaphragm 85 by means of a plate secured by a pin and nut to the center thereof which is provided with ears between which the end of the style is pivoted by means of a pin passing through a hole in the style and the ears aforesaid and it is supported near its other end or point by a slot in a cross-piece 86, held in position by a spider composed of metallic strips with a central opening, and by a slotted button 88 supported in said opening and capable of being turned therein by a handpiece 89; when the button 88 is turned so that the slot therein extends in the same direction as that in the crosspiece 86, it permits lateral movement of the style point to accommodate itself to any irregularities of the record in reproducing while if the two slots cross each other, only longitudinal movement of the style is possible and in this position it is used for recording; a point attached to the handpiece 89 engages with depressions on the central frame of the spider to secure the button 88 in the desired position; see Fig. 5.

In operation the recorder is secured in position in the annular frame 36 of the sliding frame the pointer 29 is moved by means of the knob 30 to the beginning of the scale 60, and the lever 40 is raised by moving the cam 50 into an upright position by the handpiece 53, whereby the rack 17 is raised and engages with the wormwheel 21 and the sliding frame is moved by which the point of the style is brought in operative position on the tablet 31, which may further be determined by turning the nut 46; the shaft 12 is rotated by turning the handwheel 91, or in any other usual manner; the tablet 31 is revolved through the gear 33 engaging with the gear 22 and sound operating on the diaphragm through the tube 83, the vibrating style traverses a spiral line on or in the recording material of the cylindrical tablet and a record is formed by any of the known methods of recording sound. When the tablet 31, which is progressed endwise on the rod or bar 13, by its flange 34 engaging with the groove 56 between the gear 22 and the worm-wheel 21 which moves in the rack 17, has traversed the length of the rod or bar 13, the end of the sleeve 20,

which has end motion on the shaft 12, comes in contact with and moves the collar 70 endwise on the shaft whereby the bar 71, which connects the collar 70 and the cam 50, moves the cam and throws the lever 40 out of position by gravity and thereby releases the rack 17 from the worm-wheel 21 and terminates further end motion of the tablet while at the same time the style moving with the supporting sliding frame recedes from the tablet.

When an electric motor is used to give motion to the mechanism, the movement of the lever 40, or that of its attachments, may be used to open or close the circuit of the motive current by moving an attached switch or similar device.

In reproducing sound from a record, the pointer 29 is moved by means of the knob 30 back to the beginning of the scale 60, which moves the sleeve 20 on the shaft 12 and the tablet 31 on the rod or bar 13 by means of their connections into their original positions, or the pointer 29 may be moved to any part of the scale 60 to reproduce or to repeat any part of the record, and the button 88 supporting the point of the style is turned by its handpiece 89 to bring the slot therein into line with the slot in the crosspiece 86. The lever 40 is raised by moving the cam 50 by its handpiece 53, which brings the style in operative position on the tablet and engages the rack 17 with the wormwheel 21, the shaft 12 is rotated as before and the style is adjusted by means of the nut 46; the point of the style being now capable of lateral motion conforms to any irregularities of the record and causes audible reproduction thereof.

I do not confine myself to either toothed or frictional gearing and to the arrangement of the flange in progressing the tablet endwise on the shaft as it is obvious that the several parts may be differently arranged to obtain the same result and the mechanism may be so arranged that the sliding frame may carry the style in any other than a vertical line toward and away from the surface of the tablet, but I prefer toothed gearing as by marks or lines drawn thereon or on its attachments I am enabled to always place it in the same relative position.

Heretofore, as shown in my application, Serial No. 377,724, filed January 14, 1891, as well as in other sound recording mechanisms, tablets were attached to separate tablet holders for the purpose of reciprocating or revolving them thereby; in this invention the tablet is made of rigid material and provided permanently with one or more perforated hubs or axial bearings and therefore dispenses with a tablet holder.

The advantages of the machine and its attachments are that it is simple in its arrangements and may be cheaply constructed and readily operated and by arranging the tablet, fixed rod or bar and shaft as shown a comparatively coarse thread may be used in the wormwheel and rack; the tablet is provided

with a durable record surface and as described may be entirely metallic and is not liable to be warped by atmospheric changes or the record thereon impaired by frequent reproduction as when using fragile or easily marred material, while the machine and tablet may be used with any known methods of recording sounds, such as by using an indenting, a cutting or a tracing style or either of the apparatus shown and described in my applications, Serial Nos. 400,450, and 400,451, both filed July 23, 1891, or in my application, Serial No. 401,373, filed August 1, 1891, which in that case is provided with a suitable style, may be attached to the sliding frame by the means and for the purposes set forth therein.

What I claim is—

1. In a phonograph, a recorder or reproducer in combination with a cylindrical tablet which is provided with one or more axial bearings or perforated hubs, a fixed rod or bar supporting said tablet and means for spirally revolving said tablet on said rod or bar, substantially as described.

2. In a phonograph, a fixed rod or bar and a cylindrical tablet movably mounted thereon in combination with a shaft which is capable of rotation, a sleeve encircling said shaft and capable of end motion thereon, a wormwheel attached to said sleeve, a swinging rack and gearing, substantially as described.

3. In a phonograph, a shaft which is provided with a longitudinal groove in combination with a sleeve movably encircling said shaft which is provided with a socket, and a ball operatively engaging said groove and said socket, substantially as described.

4. In a phonograph, a cylindrical tablet movably mounted on a fixed rod or bar in combination with a sleeve encircling a shaft, an arm to move said sleeve endwise on said shaft and means whereby the tablet is moved endwise on the fixed rod or bar by the end-movement of said sleeve, substantially as described.

5. In a phonograph, a swinging rack in combination with a pivoted lever, an arm movably connecting said rack with said lever, a worm-wheel, a cam or catch to hold said lever in position, a cylindrical tablet provided with an axial bearing and movably mounted on a fixed rod or bar and means for revolving said tablet spirally thereon, substantially as described.

6. In a phonograph, a swinging rack in combination with a pivoted lever, an arm movably connecting said rack with said lever, an adjustable sliding frame carrying a recorder or reproducer attached to said lever, a cam or catch to hold said lever in position, a worm-wheel, a cylindrical tablet movably mounted on a fixed rod or bar and means for revolving said tablet spirally thereon, substantially as described.

7. In a phonograph, a swinging rack and a recorder or reproducer which are movably

supported by a pivoted lever and a cam or catch to hold said lever in position in combination with a wormwheel, a cylindrical tablet movably mounted on a fixed rod or bar and means for releasing said cam or catch, substantially as described.

8. In a phonograph, an elongated style pivoted at one end on a diaphragm in combination with a support near its other end or point which is provided with a locking device to prevent or permit lateral motion of said point, substantially as described.

9. In a phonograph, an elongated style pivoted at one end on the diaphragm and provided near its other end or point with a fixed and a movable support which are provided with slots in which the style is supported, substantially as described.

10. In a phonograph, the following elements in combination, a shaft provided with means for rotating the same and with a longitudinal

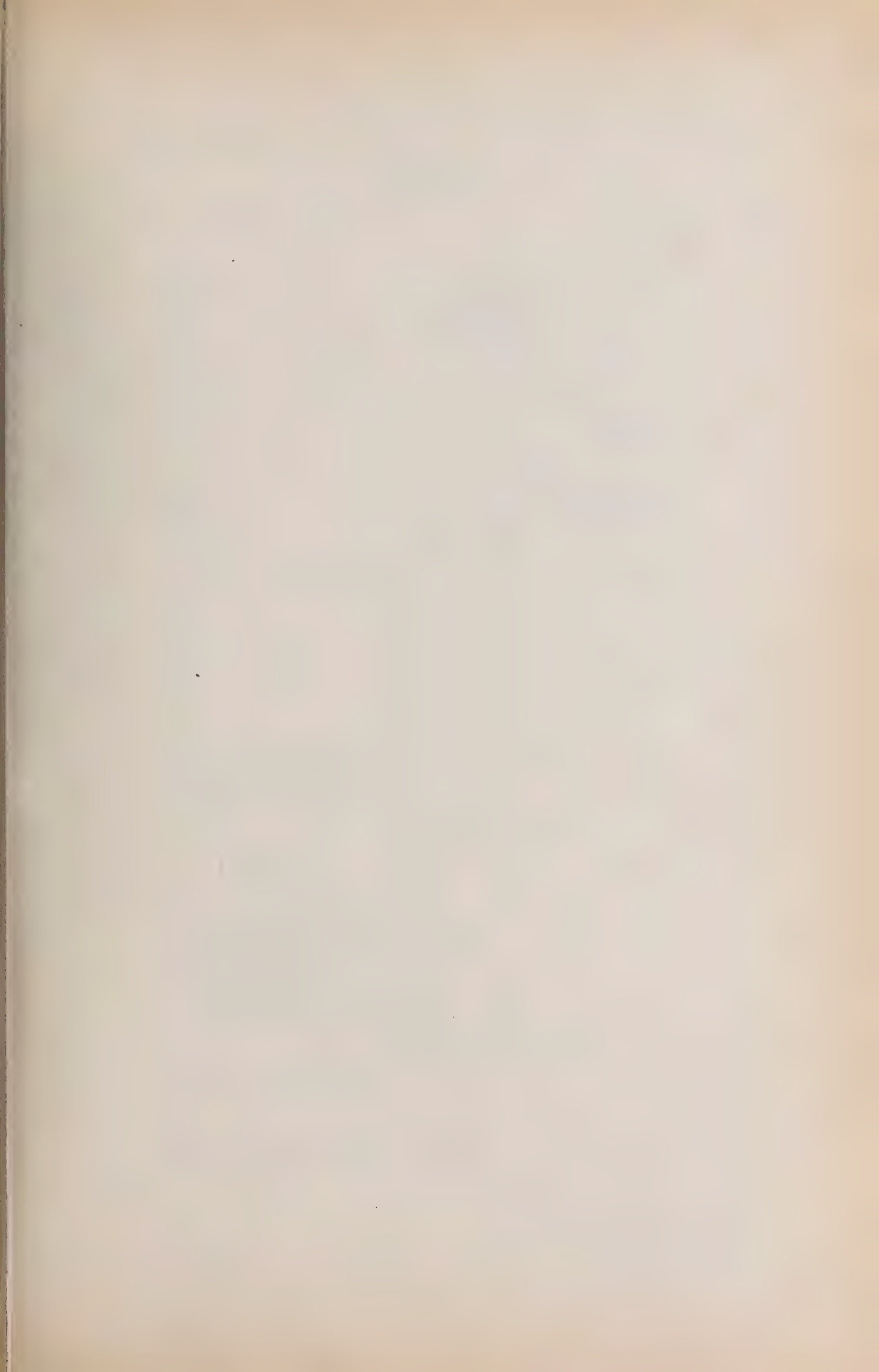
groove, a sleeve movably encircling said shaft provided with a socket, a ball operatively engaging said groove and said socket, a wormwheel attached to said sleeve, a pivoted lever provided with a cam or catch, a swinging rack and a sliding frame movably supported by said lever, a recorder or reproducer carried by said sliding frame, a fixed rod or bar which is parallel to said shaft, a cylindrical tablet provided with one or more axial bearings and movably mounted on said rod or bar and means for spirally revolving said tablet thereon, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in the presence of two witnesses, this 24th day of March, 1892.

WILLIAM BRUENING.

Witnesses:

CHARLES S. WILLIAMS,
MONTGOMERY LINDSAY.



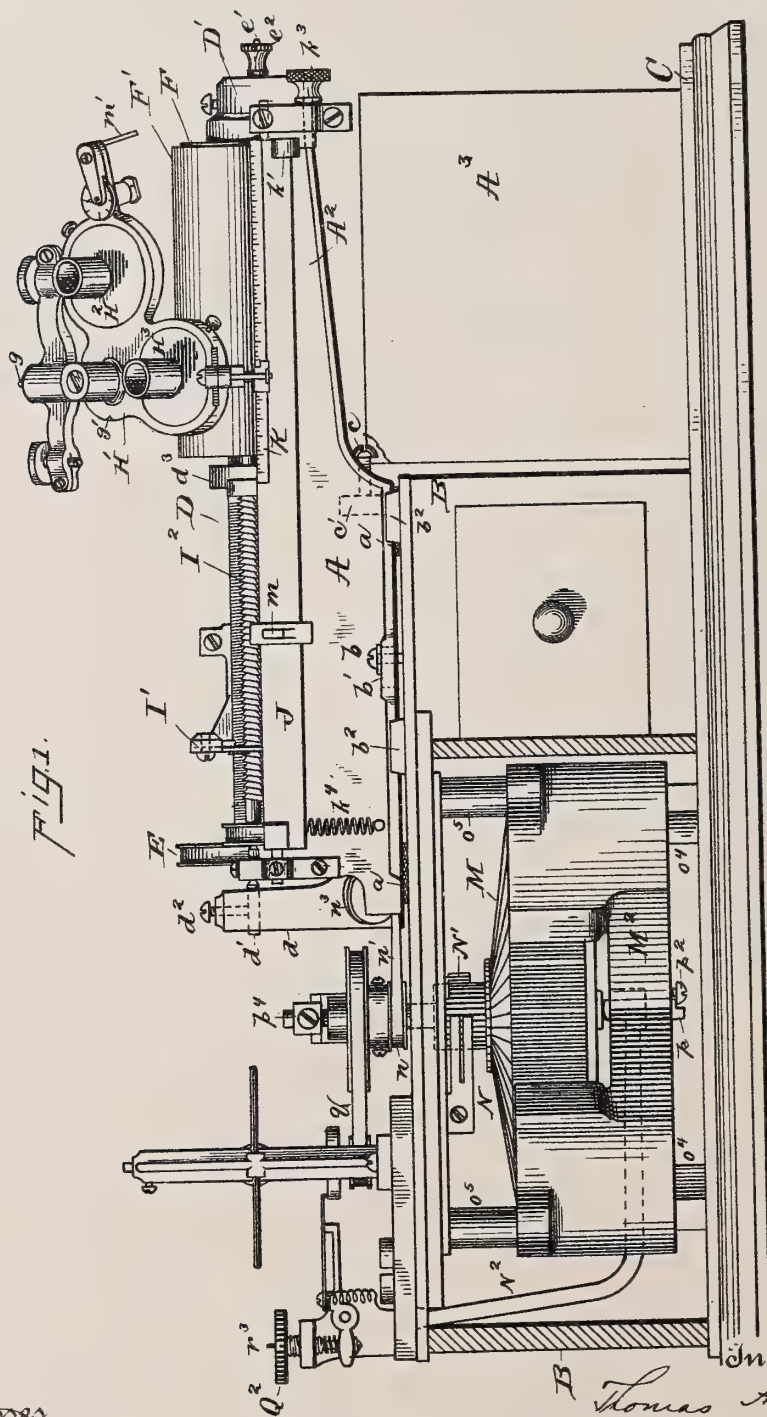
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T. A. EDISON.
PHONOGRAPH.

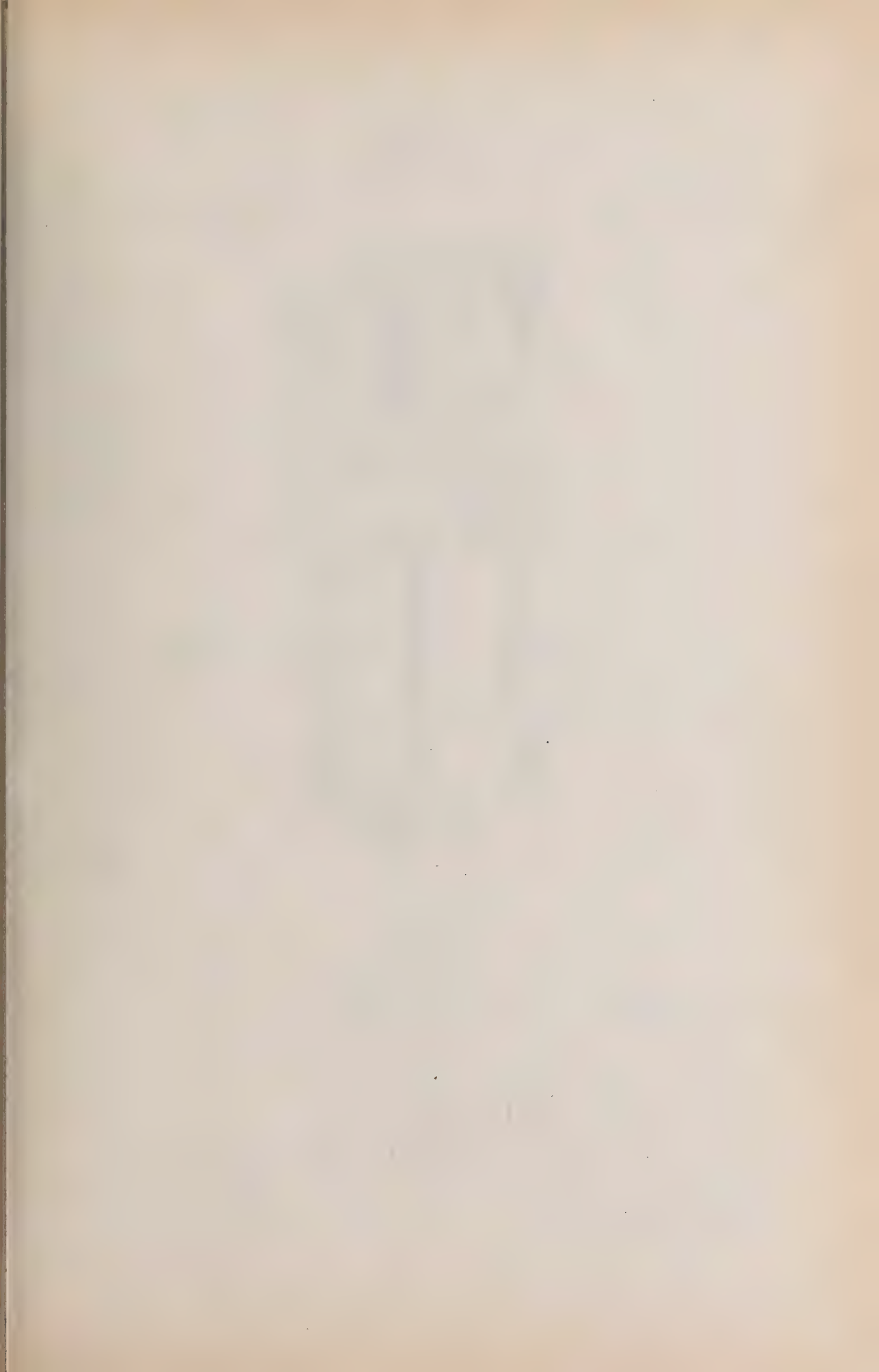
No. 499,879.

Patented June 20, 1893.



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By his Attorneys
Dyer & Seely.



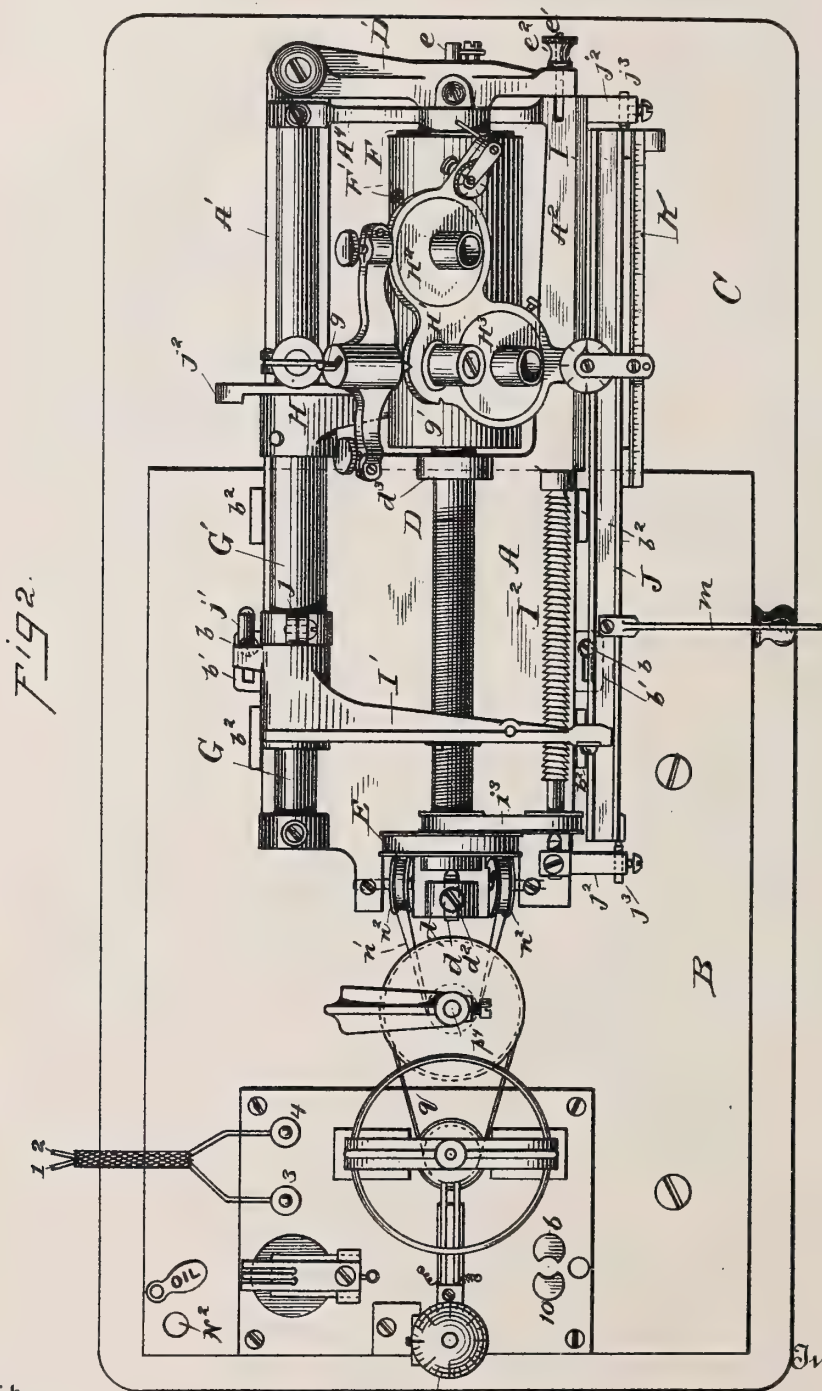
(No Model.)

7 Sheets—Sheet 2.

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



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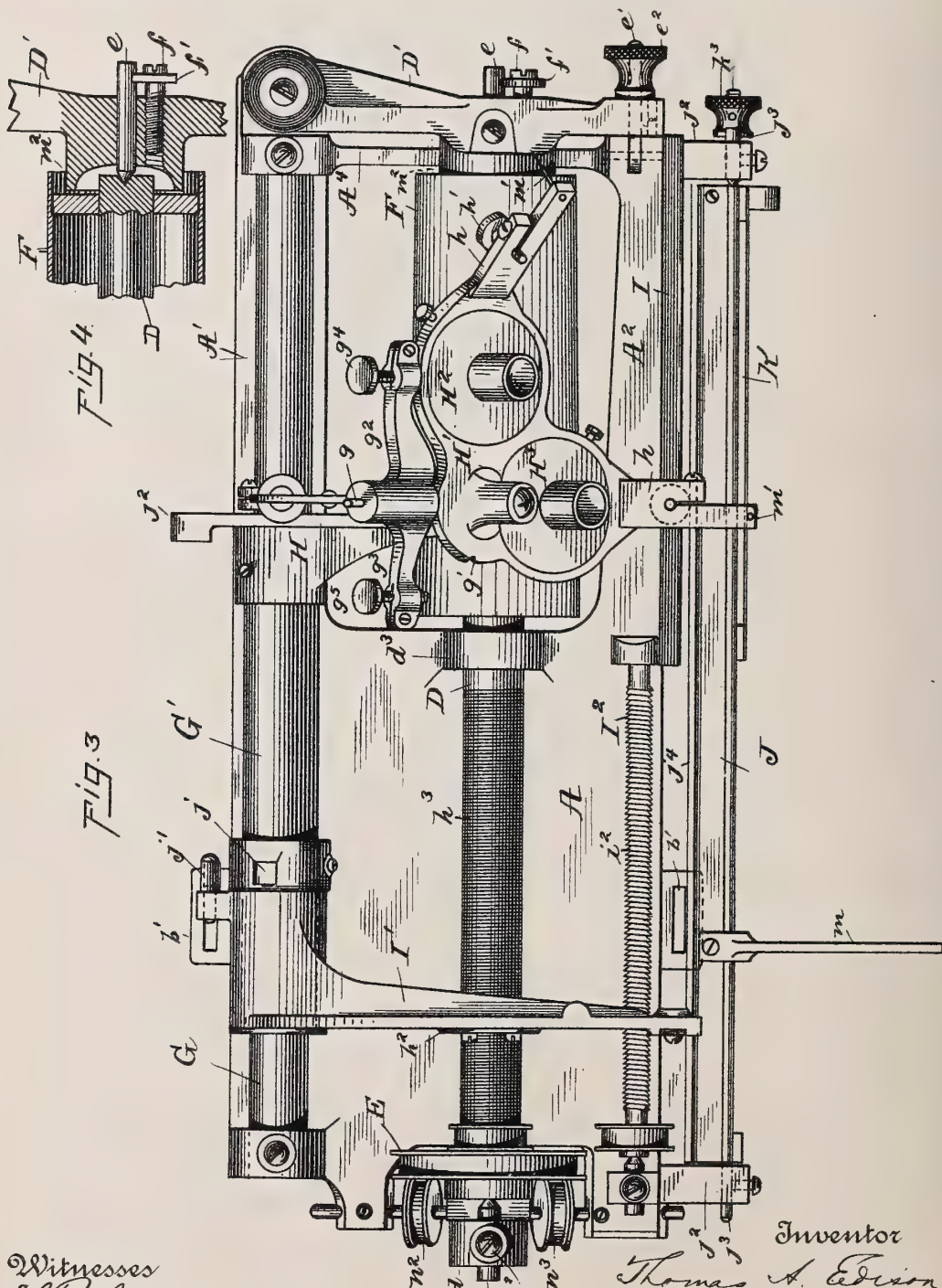
(No Model.)

7 Sheets—Sheet 3.

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No. 499,879.

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(No Model.)

7 Sheets—Sheet 4.

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.

FIG. 5.

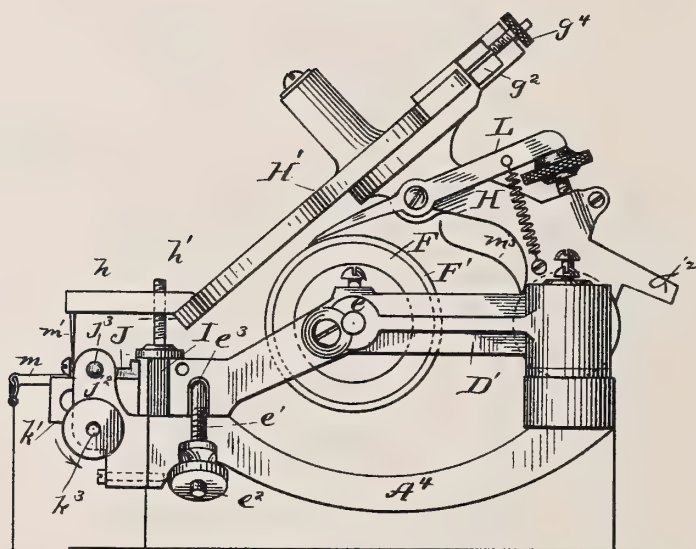
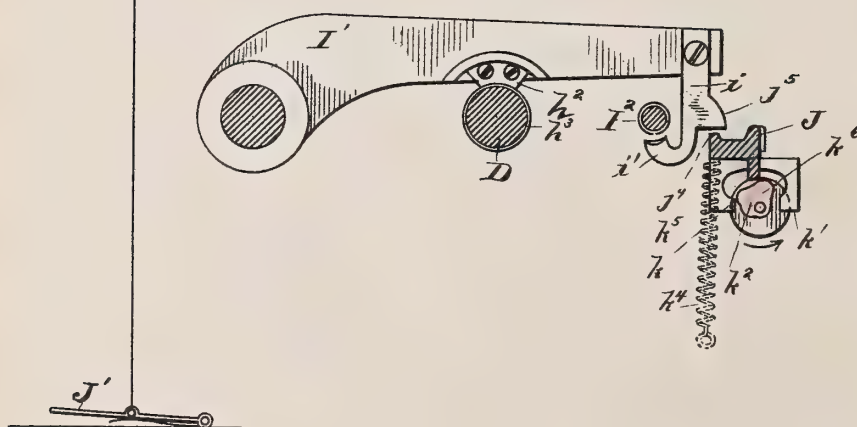


FIG. 6.



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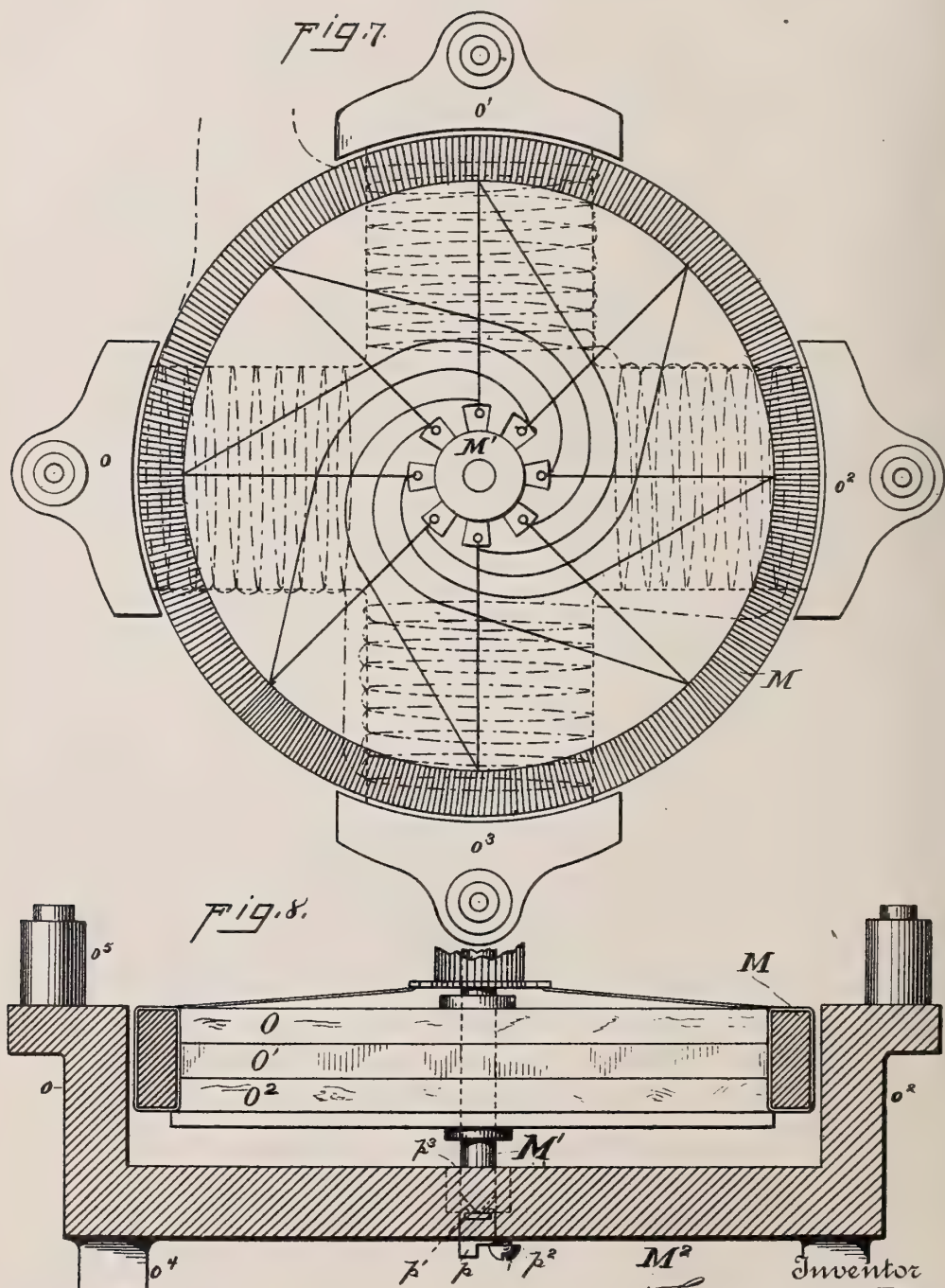
(No Model.)

7 Sheets—Sheet 5.

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



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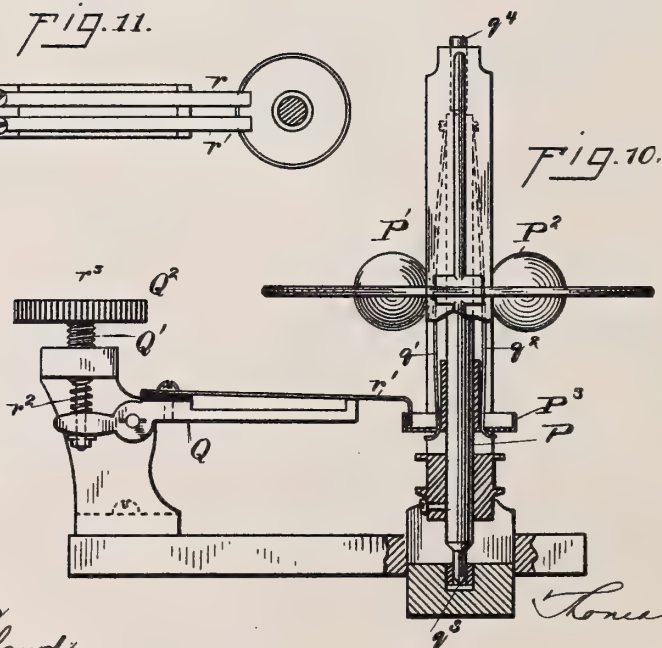
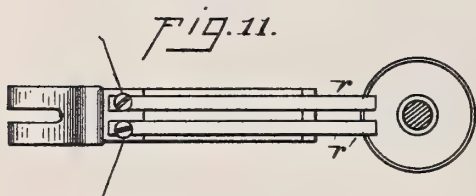
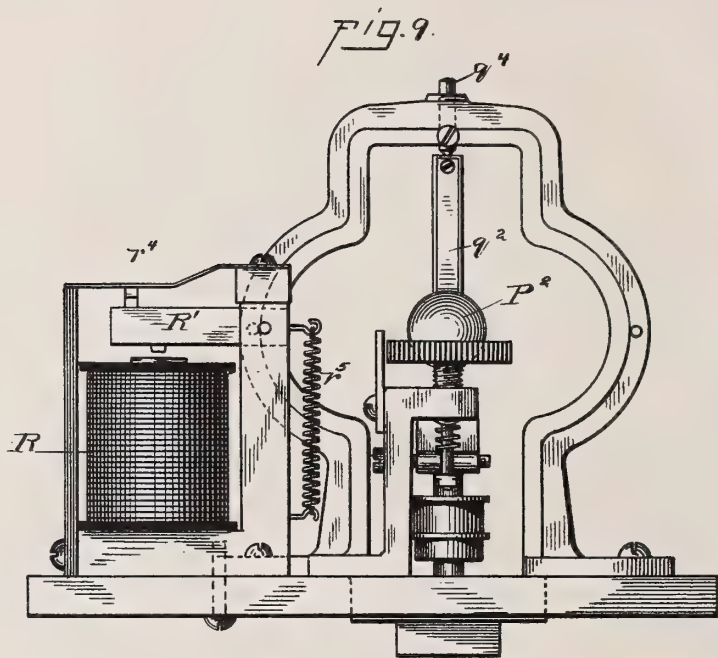
By his Attorney

Sym & Seely

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PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



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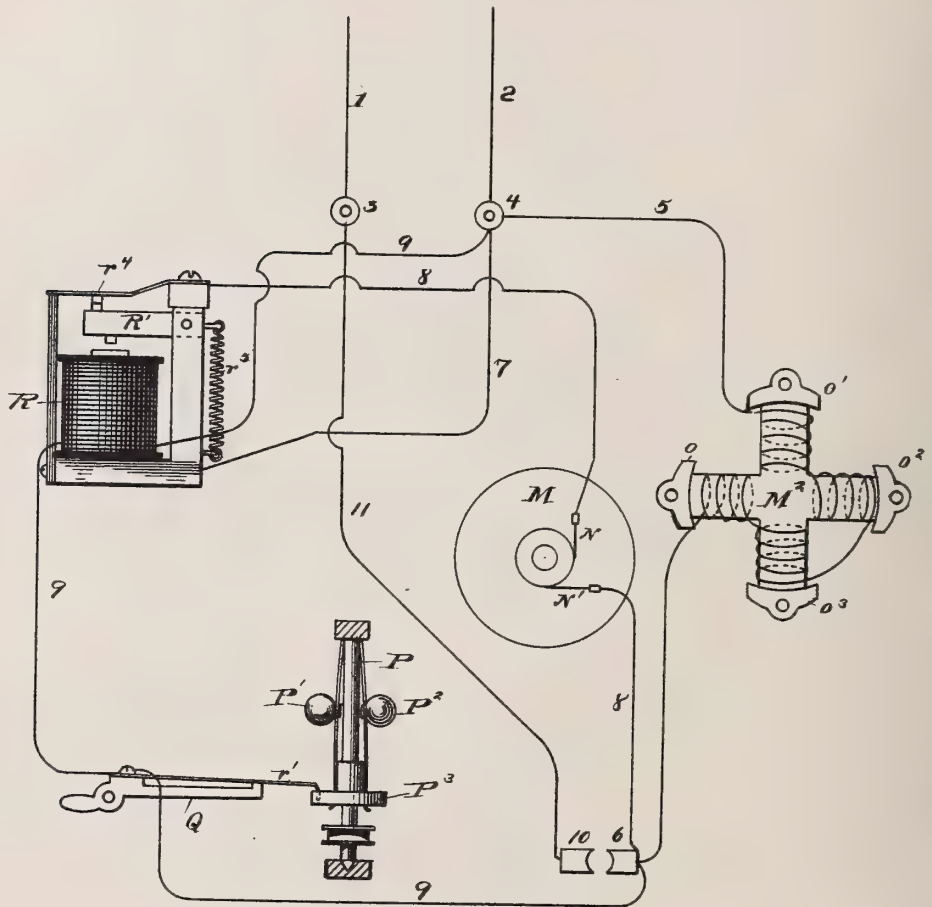
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PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.

Fig. 12.



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UNITED STATES PATENT OFFICE.

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EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 499,879, dated June 20, 1893.

Application filed July 30, 1888. Serial No. 281,453. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 792,) of which the following is a specification.

My invention relates to improvements in the mechanism of my phonograph, whereby it is made more convenient and efficient in operation.

The invention consists in the various novel devices and combinations of parts and in the method as fully hereinafter explained and pointed out by the claims.

In the accompanying drawings forming a part hereof,—Figure 1, is a front elevation of the complete machine with the front of the case broken away to show the driving motor. Fig. 2, is a top view of the complete machine. Fig. 3, is a top view of the phonograph proper on a somewhat larger scale omitting the driving and governing devices. Fig. 4, is a sectional view illustrating the movable center for supporting the outer end of the phonogram cylinder carrying shaft. Fig. 5, is an end view of the phonograph. Fig. 6, is a sectional view showing the traveler arm and connected parts. Fig. 7, is a top view of the driving motor. Fig. 8, is a sectional view of such motor. Fig. 9, is an end elevation of the speed governor. Fig. 10, is an elevation and partial section of the governor taken at right angles to Fig. 9. Fig. 11, is a top view of the contact arm of the governor; and Fig. 12, is a view principally in diagram showing the circuit connections of the electric motor and governor.

A is the frame of the phonograph proper which is mounted upon a box B, which in turn is mounted upon a suitable base C. The frame A is supported upon one end of the box B so that it overhangs such box to make room for a receptacle A³, which stands upon the base C under the overhanging phonograph frame and receives the shavings which are cut from the phonogram cylinder.

Between the phonograph frame A and the box B are placed cushions *a* of elastic material such as soft rubber, which, to a desirable

extent, prevent the vibrations of the motor contained within the box B from being transferred to the phonograph frame to the injury of the recording or reproduction of the sounds.

The frame A is secured to the box B by means of screws *b* which pass through slotted lugs *b'* on the frame A into the top of the box B. Lugs *b*² on the base B rise up on each side of the bottom edge of the frame A so as to hold such frame against lateral displacement. A screw *c* passing through a part of the frame A sets against a lug *c'* on the base B (shown in dotted lines in Fig. 1).

The screw *c* serves to adjust the frame A on the box B for the purpose of tightening the driving belt as will be presently explained, and the lugs *b'* are slotted to permit of this movement, the screws *b* being finally tightened after the proper adjustment of the driving belt has been secured.

D is the shaft of the phonograph, which is arranged horizontally and longitudinally upon the frame A. This shaft is held upon stationary centers so as to turn true and for the purpose of compensating for any wear. At the inner end of the frame A a standard *d* rises, through which passes the adjustable and removable centering pin *d'*, which is held by a set screw *d*² passing through the top of the standard *d*. At the outer end of the phonograph shaft D the centering pin *e* is carried by a swinging arm D'. This swinging arm D' is pivoted upon a side extension A' of the frame A at one end and at its other end it is removably attached to a side extension A² of the frame A by means of a bolt *e'* and a thumb nut *e*². This bolt *e'* is pivoted on the end of the side extension A² of the frame A so as to swing vertically and it enters a slot *e*³ in the end of the swinging arm D'. By loosening the nut *e*², the bolt *e'* can be swung downwardly out of the slot *e*³ when the arm D' is free to be swung upon its pivot thus exposing the outer end of the phonograph shaft D, while by swinging the arm D' inwardly, the center *e* will properly engage with the end of the shaft D and by lifting the bolt *e'* and tightening the thumb nut *e*² the arm D' will be fastened rigidly against the end of the side extension A² of the frame A. To prevent the shaft D from too great a displacement when the arm D' is

swung outwardly, it passes through a slotted standard d^3 , which rises from the base A and encircles the shaft D loosely.

The shaft D is prevented from longitudinal displacement by means of the pulley E which is secured to the inner end of the shaft D and extends below the top of the frame A, so that when the arm D' is swung outwardly the pulley E will prevent the inner end of the shaft from disengaging totally from the center d' by reason of its impingement against the base A.

The center e is a pin which passes through the arm D' and is made adjustable by means of a screw f which turns into the arm D' and has a flange f' on its head which engages with a slot in the side of the pin e . By turning the screw f it will be seen that the center pin e will be adjusted and this without turning the center pin; the turning of the center pin might be attended with a disturbance of the relative adjustment of the parts.

Upon the shaft D between the standard d^3 and the swinging arm D' is mounted the phonogram cylinder F. This is preferably a cylinder having a slight taper on its external surface, its smaller end being at the outer end of the shaft. The standard d^3 is at the end of the top plate of the frame A, the extension of such frame beyond the box B being effected by the side bars A' A². The phonogram cylinder F being located between the side bars A' A² overhangs the frame, leaving a clear space beneath the cylinder through which the cuttings from the blank drop into the receptacle A³. The tapering cylinder F is adapted to receive a cylindrical phonogram blank F' having a tapering bore adapted to fit the surface of the cylinder. By swinging the arm D' outwardly, the phonogram blank F' can be removed from the cylinder or placed upon it. To stiffen the side bars A' A² of the frame and to prevent a vibrating or tuning fork action, which would injure the record, such side bars are connected by a cross bar A⁴ at their outer ends, such cross bar A⁴ curving downwardly out of the way so as not to interfere with the manipulations of the blanks.

G is a stationary rod which is mounted in standards on the frame A and its side bar A' in rear of and parallel with the shaft D. Upon the rod G is a sleeve G', which is adapted to slide and turn freely upon such rod, and which is of less length than the rod, so that its longitudinal movement thereon will be equal at least to the length of the phonogram cylinder F. Secured to the outer end of the sleeve G' is the rocking holding arm H which is rigidly fixed to said sleeve and projects upwardly and forward over the top of the phonogram cylinder. On its upper end the rocking holding arm H carries the swinging spectacle frame H', which is pivoted to said rocking holding arm so as to swing laterally across it. A spring pin g having a beveled end enters bevel slots g' in the hub of the spectacle

frame so as to hold the spectacle frame by spring pressure at either limit of its swinging movement. The eyes of the spectacle frame carry the recorder H² and the reproducer H³, which are brought alternately into operative relation with the surface of the phonogram blank by the swinging of the spectacle frame.

The head of the rocking holding arm H is provided with laterally extending arms g^2 g^3 through which pass set screws g^4 g^5 . These set screws bear against the spectacle frame when it is swung in one direction or the other, so as to adjust the spectacle frame to bring the recorder or reproducer into the desired relation with the surface of the blank. The screw g^4 effects this adjustment for the reproducer, the result being to adjust the reproducing point laterally across the track of record, so as to bring it into the best relation with the record for reproducing the sounds, which relation can be determined by listening to the instrument. The screw g^5 serves to adjust the relation of the recorder with the surface of the blank. The purpose of this is to enable the production of a double record upon the same blank and in parallel spiral lines.

It is evident that if the recording point be made narrow relative to the feeding movement, the space between the spiral lines of record may be as wide or wider than the track of the record itself. If such is the case the unoccupied space between the lines of record may be utilized for producing a second record. The screw g^5 enables the operator to adjust the recording point so as to track in this space between the lines of the first record, and the screw g^4 enables the operator to adjust the reproducer so that it will track on either record. The eyes of the spectacle frame are provided with fingers h through which pass the adjusting screws h' which rest upon the guide rest I, which is secured to the side bar A² of the frame in front of the phonogram cylinder and parallel with its axis. The bearing of the adjusting screw h' upon the straight guide rest I causes the recorder or reproducer to advance in a straight line along the surface of the blank. The ends of the adjusting screws h' which bear upon the guide rest I are enlarged so as to overlap said guide rest for a purpose which will be presently explained.

Upon the inner end of the sleeve G' is mounted the traveler arm I', which is adapted to turn freely on the sleeve G'. This traveler arm projects forward over the shaft D between the standard d^3 and the pulley E and has a section of a nut h^2 attached removably to its lower edge and engaging with a fine screw thread h^3 , which is cut upon the shaft D between the standard d^3 and the pulley E. The nut section h^2 is removably secured to the traveler arm I' by means of screws as shown, so that it can be readily replaced when worn out; it is also made remov-

able so that it can be made of steel and have a finely cut screw surface. The traveler arm itself may be of cast iron. The traveler arm projects over the shaft D and in front of it, and at its forward end is provided with a downwardly projecting finger i having its lower end i' turned upwardly to form a hook, the end of which hook terminates in a knife edge which engages the under side of a screw shaft i^2 mounted in standards on the top plate of the frame A in front of and parallel with the screw cut section of the shaft D. The shaft i^2 is provided with a screw thread i^2 which is coarser than the screw thread h^3 . The function of the screw thread i^2 is to move the traveler arm back with a speed which is greater than the forward movement which is given such traveler arm by the screw thread h^3 . This screw thread i^2 is a ratchet thread so as to engage effectively with the hook end of the finger i and to move the traveler arm backwardly without causing a friction which would result from a tendency to force the point i' out of the thread were such screw thread beveled equally in opposite directions. The shaft I^2 is driven from the shaft D by means of a belt i^3 which passes over small pulleys on both shafts. A lug j on the sleeve G' engages with a lug j' on the hub of the traveler arm I', when the sleeve G' is turned back to the limit of its turning movement. This limit is determined by a finger j^2 on the rocking holding arm, which strikes the edge of the base A or the side bar A' when the spectacle frame is thrown backwardly over the center so that it will maintain itself in the elevated position. The lug j does not strike the lug j' until the limit of movement is nearly reached so that the effect will be to just lift the traveler nut h^2 out of engagement with the screw thread h^3 without engaging the point i' of the finger i with the reversing thread i^2 . Before this limit of the lifting movement of the spectacle frame is reached such movement does not affect the traveler arm. In front of the guide rest I and the reversing shaft I² and extending the entire length of the frame A and the side bar A² is a turning guide bar J. This turning guide bar is pivoted in lugs j^2 projecting from the frame, it being held eccentrically by centers j^3 passing through the lugs j^2 and engaging with the outer edge of the bar J at its ends. The inner edge j^4 of the bar J is made as a straight edge, and the enlarged ends of the adjusting screws h' project over this straight edge j^4 , and likewise a projection j^5 on the finger i attached to the end of the traveler arm I' projects over this edge j^4 . To one end of the bar J are secured two fingers k k' between which plays a cam k^2 , secured to the end of a turning stud k^3 having a thumb piece on its end. A spring k^4 throws the finger k down against the cam k^2 throwing the straight edge j^4 downward. The function of the cam k^2 is to turn the bar J against the tension of the spring k^4 and to

lift the edge j^4 against the tension of the spring. For this purpose the cam k^2 is provided with two risers k^5 , k^6 , the rise k^5 being less than the rise k^6 . Now by turning the cam k^2 with the fingers the effect will be to turn the bar J and to lift the edge j^4 by two successive movements. The effect of the first movement, that produced by the rise k^5 of the cam, is to lift the spectacle frame so that the recorder or reproducer will be disengaged from the surface of the blank and to lift the traveler nut h^2 out of the feeding screw h^3 so that the further feeding of the spectacle frame will be stopped. The clearance between the edge j^4 and the shoulder j^5 is slightly greater than that between the edge j^4 and the adjusting screw h' so that the recorder or reproducer will be first disengaged from the surface of the blank before the traveler nut is disengaged from its feed screw in order to prevent injury to the blank or the record on it. The effect of the second step of the movement, that produced by the rise k^6 of the cam, is to simultaneously raise the spectacle frame and traveler arm to a farther extent and to throw the point i' of the finger i into engagement with the reversing screw thread i^2 . This reverses the movement of the spectacle frame so that in reproducing the matter can be repeated to any extent desired. An arm m may be attached to the turning bar J and be connected by a cord or wire with a treadle J' so that the movements of the bar J may be produced by the foot of the operator. A scale K is attached to the front of the bar J and pointers m' are secured to the fingers h and project down in front of this scale so that the position of the recorder or the reproducer with relation to the surface of the phonogram blank can be determined. An adjustable knife L is pivoted to the rocking holding arm H for the purpose of turning off the surface of the blank. The swinging arm D' is provided with a projecting flange m^2 projecting inwardly around the center pin e and entering the end of the phonogram cylinder F, so as to act as a guard to the center pin, preventing the material which is cut from the blank from entering the space around the center and gumming up the bearing. A guard plate m^3 is attached to the side bar A' in rear of the phonogram cylinder so as to guide the shavings cut from the blank into the receptacle A³. Such shavings by reason of the movement given them by the turning of the cylinder, tend to pass over the extension A' of the frame; they are intercepted by the guard plate m^3 .

For driving the phonograph I prefer to employ an electric motor. This is inclosed in the box B, the armature M of the motor being mounted on a vertical shaft M', which passes through the top plate of the box B above which it is provided with a pulley n . An endless belt n' passes around this pulley n and passes under two guide pulleys n^2 , n^3 , which are held by centers in the frame A near the lower edge of the pulley E. The horizon-

tal shaft D of the phonograph is thus driven from the vertical shaft M' of the motor through an endless belt, whose direction is changed from a horizontal to a vertical plane by means of the guide pulleys n^2, n^3 . This belt connection between the motor and phonograph shaft is preferable to gearing since the slight mechanical vibrations of the motor are not transferred thereby to the phonograph. It will be seen that by adjusting the set screw c any tension desired can be given to the belt n' . The form of electric motor employed is a multipolar motor, it having four field magnet poles o, o', o^2, o^3 . These poles project upwardly from a four armed plate M². The armature M revolves above the plate M², the arms of the plate M² being wound with the field magnet wire. The plate M² is supported from the bottom of the box B by suitable legs o^4 and is steadied from the top plate of the box B by studs o^5 . The vertical shaft M' of the motor is stepped in the center of the plate M². A hole is cut through the center of the plate M² and into this hole is introduced from the under side of the plate M² a block p of metal carrying in its upper end a flat agate p' . The plug step p is made adjustable by means of a screw p^2 entering the bottom of the plate M² and bearing at one side of its head on the plug p , so that by turning this screw the plug p can be adjusted. The lower end of the shaft M' is brought to a rounded point where it rests on the agate p' , the shaft above the agate being surrounded by a bushing p^3 of brass or other suitable material; the shaft at its upper end is held by a center pin p^4 . The commutator brushes of the motor are shown at N N'. An oil tube N² extends from the top plate of the box B down to the step bearing of the motor shaft. The armature of the motor is a Gramme ring which is secured to a hub on the shaft by means of three layers O, O', O² of wood, which are placed so that the grain of the middle layer is at right angles to the grain of the two outside layers. The ring armature is of considerable size, so as to act as a fly wheel and so as to have a considerable surface velocity with a relatively low axle speed. The motor employed, being an electro-dynamic motor, has a high degree of efficiency, which efficiency is increased by the fact that it is a multipolar motor, since the magnetism has a shorter distance to travel through the iron of the armature and a more intense field is produced. With the fly wheel form of armature it would not be possible to get as intense a field or one as uniform with a field magnet having but two poles. I have also found that by using a motor with a vertical shaft a great reduction can be made in the power of the driving battery over what would be required by a motor mounted on a horizontal shaft. The motor being nicely balanced on its jewel step seems to require very little power to drive it and does not produce troublesome vibrations in the phonograph.

To control the speed of the motor and make it uniform, I provide a governor. This governor has a shaft P which is driven by an endless belt q from a pulley on the motor shaft. Centrifugal balls P' P² are secured to springs $q' q^2$ which are attached at their upper ends to the shaft P and at their lower ends hold a plate P³ which surrounds the shaft P and is raised and lowered by the centrifugal balls P' P². The shaft P is a vertical shaft stepped at its lower end on the flat agate q^3 and held at its upper end by a center pin q^4 . The movement of the plate P³ by the governor balls serves to make and break circuit between two springs r, r' which are held by a pivoted lever Q which is adjustable by means of a screw Q' passing through a suitable support with which its screw thread engages and also passing through the end of the lever Q below which it is provided with a nut and above which it has a spring r^2 to prevent any lost motion at the connection between the screw Q' and the lever Q. It will be seen that by adjusting the elevation of the lever Q the point at which the plate P³ will touch both the springs r, r' will be varied, and since this point is the point at which the speed of the motor is checked, it will be seen that the motor can be varied in its speed, which it is desirable to do in reproducing the sounds from phonogram blanks, since the speed at which the sound record was made will be indicated upon the blank and the machine can be set for that speed. The head Q² of the screw Q' is provided with a suitable index as shown, by means of which and the pointer r^3 the adjustment of the governor can be determined.

R is an electro-magnet whose armature R' breaks circuit at its back point r^4 , the armature being retracted by a spring r^5 .

The electric connections of the motor and the governor are illustrated in Fig. 12, in which 1, 2, represent the wires from the battery or other source of electrical energy leading to the binding posts 3, 4, which are located upon the box B. From the binding post 4, a wire 5 passes to the field magnet of the motor and from thence to the plate 6 of a plug switch. From the binding post 4 also extends a wire 7 connected to the base of the magnet R and hence to its armature R'. From the insulated back point r^4 of the magnet a wire 8 extends to the armature M of the motor and from thence to the plate 6 of the plug switch; also extending from the binding post 4 is a wire 9 which includes the coils of the magnet R and thence extends to the spring r at which the wire is broken. The wire 9 is continued however from the spring r' to the plate 6 of the plug switch. From the plate 10 of the plug switch a return wire 11 is run back to the binding post 3.

It will be seen that the armature of the motor, its field magnet and the governor magnet R are in three separate multiple arc circuits from the battery. The circuit of the field magnet is never opened except at the plug switch, which

opens all of the circuits at once. The circuit of the armature however of the motor is opened whenever the magnet R moves its armature R' off of the back point r^4 . The magnet R is wound to a high resistance and is extremely sensitive in its action, so that the instant the circuit to this magnet is closed by the plate P³ touching the springs r r' , the magnet will act and will open the circuit of the armature. This makes a much more sensitive governing device than if it were attempted to control the circuit of the armature by means of the governor directly. The field magnet circuit of the motor not being opened by the governor the spark which would be caused by the discharge of the field magnets will not be present.

What I claim as my invention is—

1. In a phonograph, the combination with the phonogram cylinder and its carrying shaft, of centers upon which said shaft turns and a swinging arm upon which one of said centers is mounted, substantially as set forth.

2. In a phonograph, the combination with the phonogram cylinder and its carrying shaft, of centers on which the said shaft turns, a swinging arm carrying one of said centers and a standard through which such shaft passes loosely for preventing displacement of the shaft when the center is swung away from its end, substantially as set forth.

3. In a phonograph, the combination with the phonogram cylinder and its carrying shaft, of centers on which said shaft turns, a swinging arm carrying one of said centers and the driving pulley on the shaft extending below the top of the frame so as to lock the shaft against longitudinal displacement, substantially as set forth.

4. In a phonograph, the combination with the cylinder shaft, of the cylinder mounted on one end of said shaft, centers on which the shaft turns and a swinging arm carrying the center at the cylinder end of the shaft whereby the end of the cylinder can be exposed for receiving or removing the phonogram blank, substantially as set forth.

5. In a phonograph, the combination with the supporting frame, of a shaft overhanging the frame, the phonogram cylinder placed on the overhanging portion of the shaft and a removable bearing for this overhanging end of the shaft, substantially as set forth.

6. In a phonograph, the combination with the supporting frame, of the cylinder shaft mounted upon such frame and overhanging the same at one end, the phonogram cylinder mounted on the overhanging end of the shaft, side bars extending from the frame out to the end of the shaft and a movable arm connecting such side bars and carrying the outer bearing of the shaft, substantially as set forth.

7. In a phonograph, the combination with the frame A, having side bars A' A² and the phonogram cylinder and shaft, of the swinging arm D' carrying the center for the outer end of the shaft and pivoted upon one of said

side bars and locked to the other side bar by the swinging bolt e' and nut e^2 , substantially as set forth.

8. In a phonograph, the combination with the frame A having side bars A' A² and the phonogram cylinder and shaft, of the swinging arm D' carrying the center for the outer end of the shaft and the bar A⁴ connecting the side bars of the frame, substantially as set forth.

9. In a phonograph, the combination with the rocking holding arm and the traveler arm, of a movable bar acting upon both of such arms and lifting them together, substantially as set forth.

10. In a phonograph, the combination with the rocking holding arm and the traveler arm, of a bar having a straight edge extending beneath both of such arms and pivoted so as to be capable of a turning movement, whereby it will lift said arms together, substantially as set forth.

11. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the pivoted lifting bar extending under both the rocking holding arm and the traveler arm and a cam for turning said lifting bar, substantially as set forth.

12. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the feeding and reversing screws, the turning lifting bar and the cam having two rises for giving such lifting bar two successive movements, substantially as set forth.

13. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the stud for lifting the traveler arm when the rocking holding arm has reached the limit of its lifting movement, substantially as set forth.

14. In a phonograph, the combination with the supporting rod and the sleeve sliding and turning thereon, of the rocking holding arm secured to said sleeve, the traveler arm turning upon such sleeve, a stop for determining the limit of the lifting movement of the rocking holding arm and studs for lifting the traveler arm when the rocking holding arm has reached the limit of its lifting movement, substantially as set forth.

15. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the turning lifting bar acting upon both of said arms and the foot treadle connected with said turning lifting bar for operating it, substantially as set forth.

16. The method of producing more than one record on the same phonogram blank consisting of first making one record thereon and then adjusting the recording point to an intermediate position between the adjacent spiral lines of the preceding record and making an additional record, whereby without increasing the fineness of the feeding screw more matter can be recorded upon a phonogram blank of given length, substantially as set forth.

17. In a phonograph, the combination with the rocking holding arm, of the guide rest and the adjustment upon such guide rest having a bearing overlapping the guide rest and a turning lifting bar beneath the overlapping bearing, substantially as set forth.

18. In a phonograph, the combination with the phonogram cylinder and shaft, of the swinging arm carrying the center for the cylinder end of the shaft and the wax guard surrounding such center and entering the end of the cylinder, substantially as set forth.

19. In a phonograph, the combination with the phonogram cylinder and the turning off knife or tool, of the wax guard in rear of such cylinder for directing the shavings into a receptacle beneath the cylinder, substantially as set forth.

20. In a phonograph, the combination with the horizontal main shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor mounted upon a vertical shaft, and a belt connection between the motor shaft and the phonograph shaft, substantially as set forth.

21. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, the armature and the field magnet of said motor being connected in multiple arc, and a speed governor controlling the armature circuit, substantially as set forth.

22. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, and having its armature and its field magnet in separate multiple arc circuits, a magnet controlling the armature circuit, and a centrifugal governor controlling the said magnet, substantially as set forth.

23. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, a speed governor controlling the speed of said motor by opening the circuit thereof when a predetermined speed has been obtained, and an adjusting screw for varying the point at which the governor will affect the circuit, substantially as set forth.

24. In a phonograph, the combination with the phonograph shaft, the phonogram blank

carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, a centrifugal governor controlling such motor by closing circuit at contacts and an adjustment for varying the position of such contacts whereby the speed of the motor can be varied, substantially as set forth.

25. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, a magnet controlling said motor, contacts mounted upon an adjustably pivoted lever at which the magnet circuit is broken and a centrifugal governor moving a disk which closes the magnet circuit at such contacts, substantially as set forth.

26. In a phonograph, the combination with the frame supporting the phonograph shaft, the phonogram blank carrier, and the recording and reproducing devices, of an electric motor mounted upon a base and connected by a belt with the phonograph shaft, and means for adjusting the phonograph frame to tighten said belt, substantially as set forth.

27. In a phonograph, the combination with the phonograph proper in which are combined a phonograph shaft, a phonogram blank carrier revolved thereby, and recording and reproducing devices, the same being mounted upon a separate frame, of a base carrying a motor connected with the said shaft for driving the same, and cushions of elastic material between said base and the phonograph frame, substantially as set forth.

28. In a phonograph, the combination with the frame of the phonograph proper, of the base carrying a motor connected by a belt with the phonograph shaft, guiding lugs upon the base, slotted lugs and screws for securing the phonograph frame to the base and an adjusting screw for adjusting the phonograph frame upon the base for the purpose of tightening the belt, substantially as set forth.

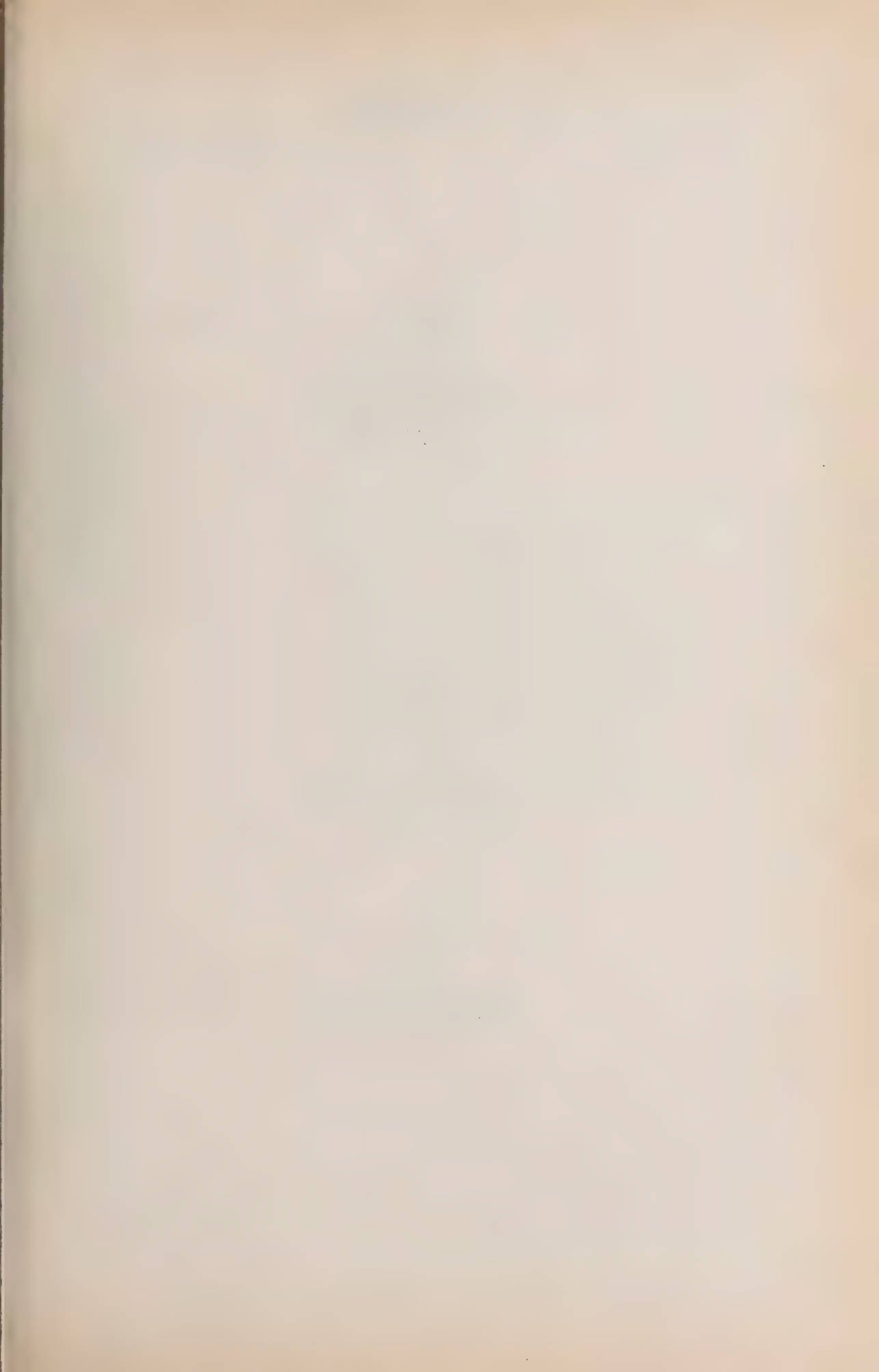
29. In a phonograph, the combination with the feed screw and the traveler arm, of the nut section secured rigidly but removably to said traveler arm and engaging with said feed screw, substantially as set forth.

This specification signed and witnessed this 27th day of July, 1888.

THOS. A. EDISON.

Witnesses:

RICHD. N. DYER,
WILLIAM PELZER.

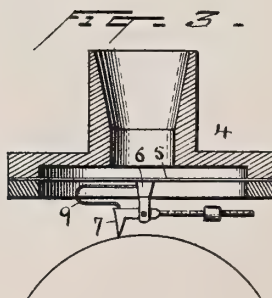
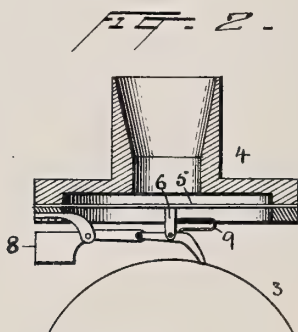
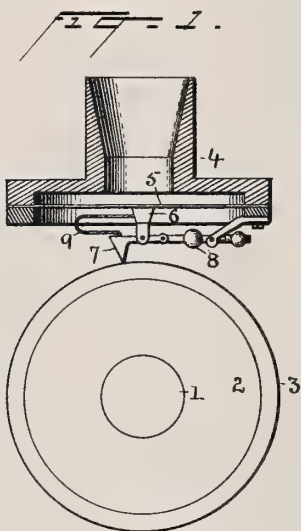


(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 500,280.

Patented June 27, 1893.



Witnesses
Norris A. Clark
Nicholas F. Oberly

Inventor
T. A. Edison
By his Attorneys
Syer & Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 500,280, dated June 27, 1893.

Application filed November 21, 1890. Serial No. 372,224. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 881,) of which the following is a specification.

My invention relates to recording and reproducing devices of phonographs, and my object is to enable such devices to work satisfactorily notwithstanding irregularities in the surface of the phonogram blank. Sometimes in the manufacture of phonogram blanks, irregularities or eccentricities occur in the formation of the surface, and sometimes the blanks become warped after manufacture, and if provision is not made to prevent it, such irregularities will occasion movements of the recording or reproducing point and the diaphragm, which will interfere with the recording or reproducing of the sound.

The present invention consists in an apparatus adapted to obviate this defect.

In the accompanying drawings which illustrate the invention, Figure 1 is a cross sectional view of a recorder embodying my improvement. Fig. 2 is a like view of a slightly modified form; and Fig. 3 shows a similar recorder with the adjustable weight directly on the recorder arm.

1 is a phonograph shaft, 2 a phonograph cylinder, and 3 a phonogram blank.

4 is a ring or frame which supports the diaphragm 5. On the under side of said diaphragm is a block or post 6, to which is pivoted the lever 7, having at one end the operating point. The opposite end of said lever is connected to an extra weighted lever 8, pivotally supported as shown. The end of the lever distant from the lever 7 preferably slightly overbalances the end nearer said lever. This construction tends to throw the operating point against the phonogram blank.

The pressure of the point against the phonogram blank may be still further modified if desired by a spring 9, co-operating with the weighted lever or pressing the recorder in an opposite direction, as desired. The weight or weights on lever 8 are preferably adjust-

able. In Fig. 1 the lever is shown with screw threads on which the weight at the right may be moved. In Fig. 3 a similar adjustable weight is supported directly on the recorder arm 7.

The extra lever, that is, the weighted lever 8, is not readily moved by the sound vibrations, which have to and fro movements of great rapidity and large number per second, so that said lever acts as though it were fixed, and all the energy due to the sound waves, or the sound record, is communicated directly from the diaphragm to the recording point, or from the reproducing point to the diaphragm, while the movements given to such points by eccentricities of the phonogram being comparatively long and slow, overcome the tendency to inaction of the retarding device, and so permit a movement independent of the diaphragm.

When the invention is used in connection with a reproducer the operating point will or may be of slightly different shape.

Having thus described my invention, what I claim is—

1. The combination of a phonograph diaphragm, a pivoted recorder or reproducer, and an extra pivoted lever weighted, substantially as described.

2. The combination of a phonograph diaphragm, a recorder or reproducer pivoted adjacent to the center of the diaphragm, an extra weighted lever constituting a retarding device, and a connection between said device and the recorder or reproducer, substantially as described.

3. The combination of a phonograph diaphragm, a recorder or reproducer pivoted at or near the center of the diaphragm, a counter-balanced retarding arm pivoted as described, and a hinge or pivotal connection between said arm and the recorder or reproducer, substantially as described.

4. The combination of a phonograph diaphragm, a recorder or reproducer pivoted at or near the center of the diaphragm and having means to force it slightly toward the phonogram blank, a weighted retarding arm pivoted and having an excess of weight on the side of the pivot opposite to the recorder

or reproducer, and a connection between said arm and the recorder or reproducer, substantially as described.

5 5. The combination of a pivoted phonograph recorder or reproducer, and an adjustable counter - balance, substantially as described.

This specification signed and witnessed this 27th day of October, 1890.

THOS. A. EDISON.

Witnesses:

CHARLES M. CATLIN,
RICH'D. N. DYER.

500 -

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 500,281, dated June 27, 1893.

Application filed November 21, 1890. Serial No. 372,226. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 885,) of which the following is a specification.

My invention relates to the manner of constructing and mounting the sound receiving or the reproducing diaphragm or vibrating body and the recorder or reproducer in phonographs, and the object is to construct an apparatus which shall operate satisfactorily notwithstanding irregularities or eccentricities which are sometimes found in phonogram blanks owing to imperfections in their manufacture, or to warping after manufacture.

In the accompanying drawings which illustrate the invention, Figure 1 shows a central section of a recorder embodying the improvement. Fig. 2 is a plan of the vibrating diaphragm or body.

1 is the phonograph shaft, 2 the phonograph cylinder, and 3 the phonogram blank.

4 is a mouth piece, below which is a cup shaped body 5, the bottom of which constitutes the phonograph diaphragm. This body is unconfined at its edges so that it has a bodily movement up or down without changing the tension of the portion which constitutes the diaphragm and is supported on or by the operating point.

6 is a post to which is pivoted or movably connected, a recorder or reproducer 7, the free point of which rests on the phonogram blank.

8 is a rod, block or similar device, which connects the recorder or reproducer with the vibrating body.

In using the apparatus above described when irregularities of the blank come under the point of the recorder or reproducer the diaphragm or vibrating body is raised or lowered bodily as will be evident, but when the recorder or reproducer is subjected to the very rapid vibrations due to sound waves, or to the sound record, the vibrating body will not move up or down as a whole owing to the in-

ertia of the body, but will vibrate as an ordinary diaphragm.

It will be evident that the form of the vibrating body may be changed without departing from my invention—for example the vertical rim 5' around the edge of the body is not essential, although it is found that the weight of the rim around the edge is advantageous.

Having thus described my invention, what I claim is—

1. The combination, in a phonograph having a phonogram blank or recording surface, of a recorder or reproducer in operative relation to said blank, and a diaphragm or vibrating body unsupported at its edge, and a connection between said recorder or reproducer and diaphragm, substantially as described.

2. The combination, in a phonograph having a phonogram blank or recording surface, of a recorder or reproducer in operative relation to said blank, a diaphragm having an unconfined rim around its periphery, and a connection between said recorder or reproducer and diaphragm, substantially as described.

3. The combination of a phonograph diaphragm unconfined at its periphery and a recorder or reproducer connected to the diaphragm, substantially as described.

4. The combination, in a phonograph, of a diaphragm unconfined at its periphery, a phonogram blank, a pivoted recorder or reproducer in operative relation to said blank and connected to the diaphragm at or near its center, substantially as described.

5. The combination of a phonograph recorder or reproducer and a diaphragm supported thereby, substantially as described.

6. The combination of a phonograph recorder or reproducer and a diaphragm supported thereby and having a weight at its periphery, substantially as described.

This specification signed and witnessed this 17th day of November, 1890.

THOS. A. EDISON.

Witnesses:

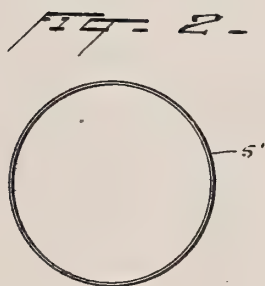
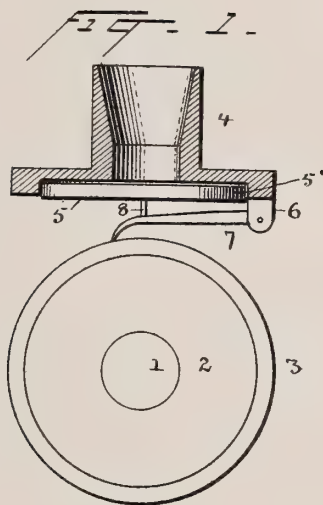
HARRY F. MILLER,
THOMAS MAGUIRE.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 500,281.

Patented June 27, 1893.



Witnesses
Norris A. Clark,
Nicholas F. Clark.

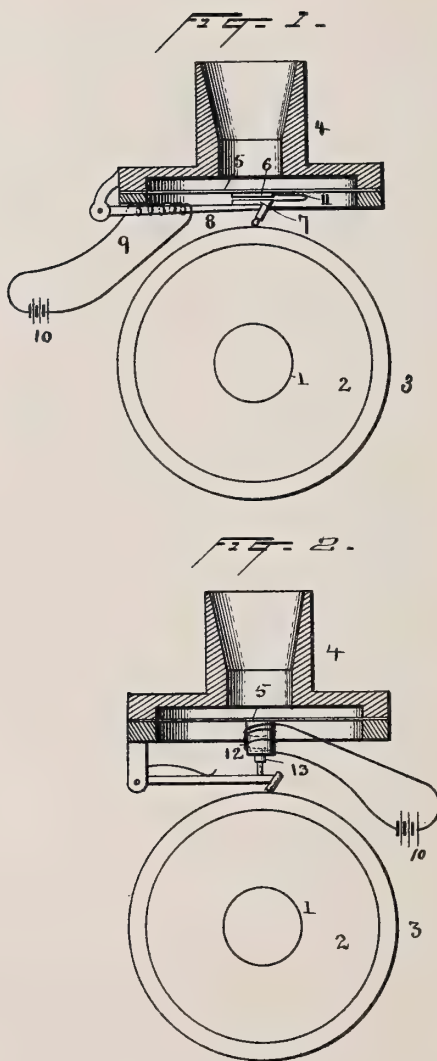
Inventor
T. A. Edison,
By his Attorneys
Syer & Seely.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 500,282.

Patented June 27, 1893.



Witnesses
Norris A. Clark
Nicholas F. Clark

Inventor
T. A. Edison,
By his Attorneys
Syer & Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 500,282, dated June 27, 1893.

Application filed December 3, 1890. Serial No. 373,412. (No model.)

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 896,) of which the following is a specification.

The present invention relates to means for forming an operative connection between a phonograph diaphragm and a recorder or reproducer, which connection shall effectively transmit the vibrations due to sound waves or the sound record, but shall allow a movement of the recorder or reproducer independent of the diaphragm under the influence of larger irregularities or eccentricities due to imperfection of the phonogram blank or recording surface.

In the accompanying drawings, which illustrate the invention, Figure 1 shows a view partially in section of one form of recorder, and Fig. 2 shows a similar view of a modified form of recorder.

1 is the phonograph shaft, 2 the phonograph cylinder, and 3 a phonogram blank.

4 is the usual mouth piece, or tube to which the mouth piece may be connected, below which is a diaphragm 5. At the center of the diaphragm is a magnetic piece or member 6 cemented to or forming a part of the diaphragm. Below this magnetic piece is a second corresponding member 7, supported on or forming a part of the pivoted recorder arm 8. This arm may be magnetized by means of a coil 9 in circuit with battery 10, or in any other convenient manner. In this form I prefer to connect the pieces 6, 7 by a light spring 11 to supplement the magnetic connection.

In Fig. 2 is shown attached at the center of the diaphragm a coil or solenoid 12, and to the pivoted recorder arm is connected a magnetic core 13.

In the drawings the means for turning the phonogram blank and for feeding the recorder or reproducer lengthwise of the phonogram blank are not shown since they may be of well known construction and are not specifically claimed herein.

The connection described between the re-

recorder or reproducer and the diaphragm is found to faithfully transmit the vibrations due to sound from the diaphragm to the recorder, or in reproducing from the reproducer to the diaphragm, but when said recorder or reproducer is moved more slowly by irregularities or eccentricities of the phonogram blank the magnetic connection yields so that the recorder or reproducer moves independently of the diaphragm. Hence the record or the reproduction is substantially independent of such irregularities.

Having thus described my invention, what I claim is—

1. The combination of a phonograph diaphragm or vibrating body, a recorder or reproducer, the diaphragm and recorder or reproducer being connected magnetically, substantially as described.

2. The combination of a phonograph diaphragm, a recorder or reproducer, the diaphragm and recorder or reproducer being slightly separated but connected magnetically, substantially as described.

3. The combination of a phonograph diaphragm, a magnetic member thereon, a recorder or reproducer and a magnetic member thereon, and in operative relation to the first member, substantially as described.

4. The combination of a phonograph diaphragm having a magnetic member, and a recorder and a reproducer having a magnetic arm, substantially as described.

5. The combination of a phonograph diaphragm, a magnetic member at or near its center, a recorder, a magnetic piece connected thereto, and a spring connecting said diaphragm and recorder, substantially as described.

6. The combination of a phonograph diaphragm, a magnetic portion at or near its center, a recorder having a magnetic arm and means for magnetizing it, and a spring connecting said diaphragm and magnetic piece, substantially as described.

This specification signed and witnessed this 1st day of December, 1890.

THOS. A. EDISON.

Witnesses:

JOHN F. RANDOLPH,
W. PELZER.



(No Model.)

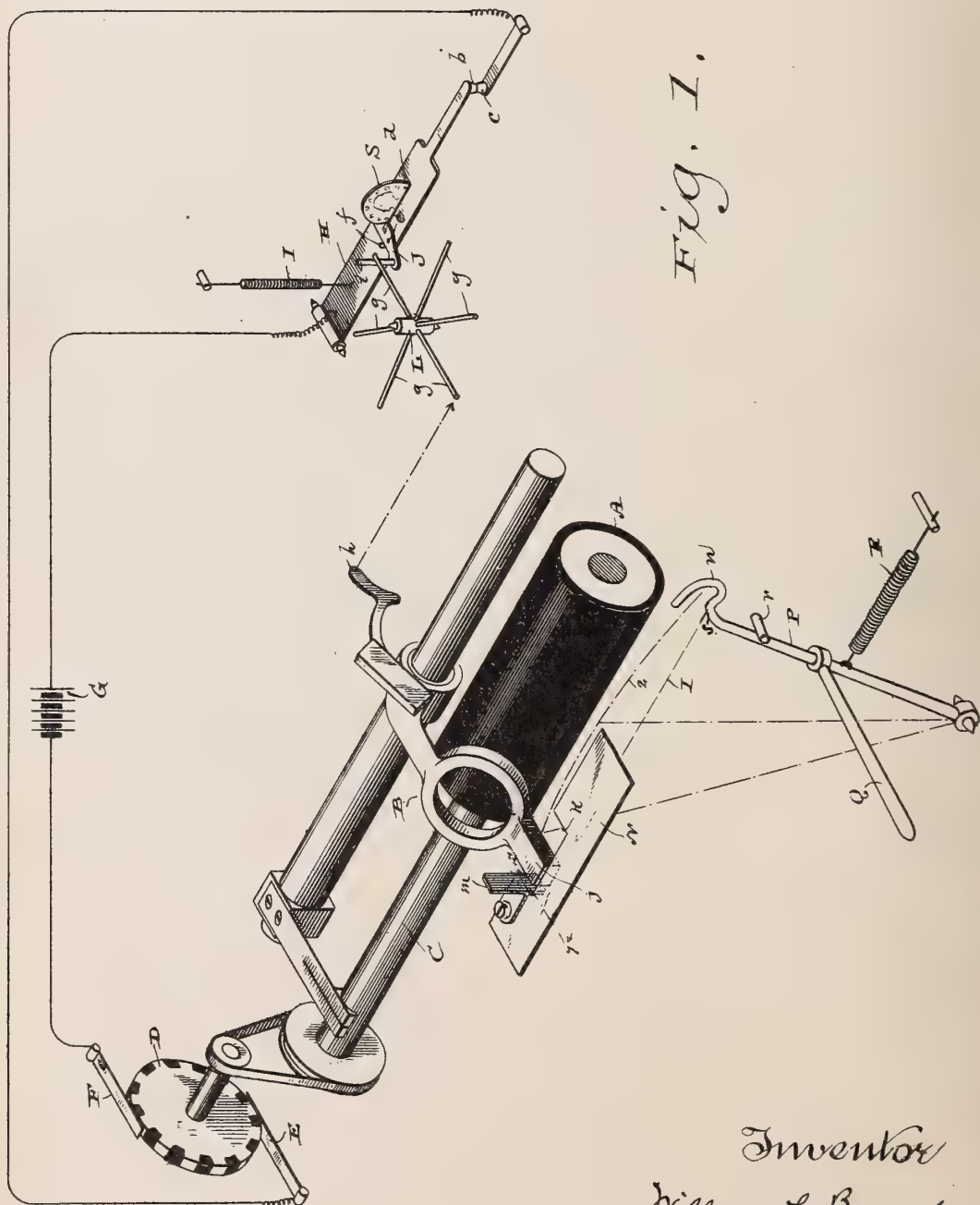
2 Sheets—Sheet 1.

W. S. BURNETT.

COMBINED PHONOGRAPH AND COIN OPERATED MECHANISM.

No. 502,246.

Patented July 25, 1893.



Witnesses
Geo. W. Young
N. E. Oliphant

Inventor
William S. Burnett
By H. G. Underwood
Attorneys

(No Model.)

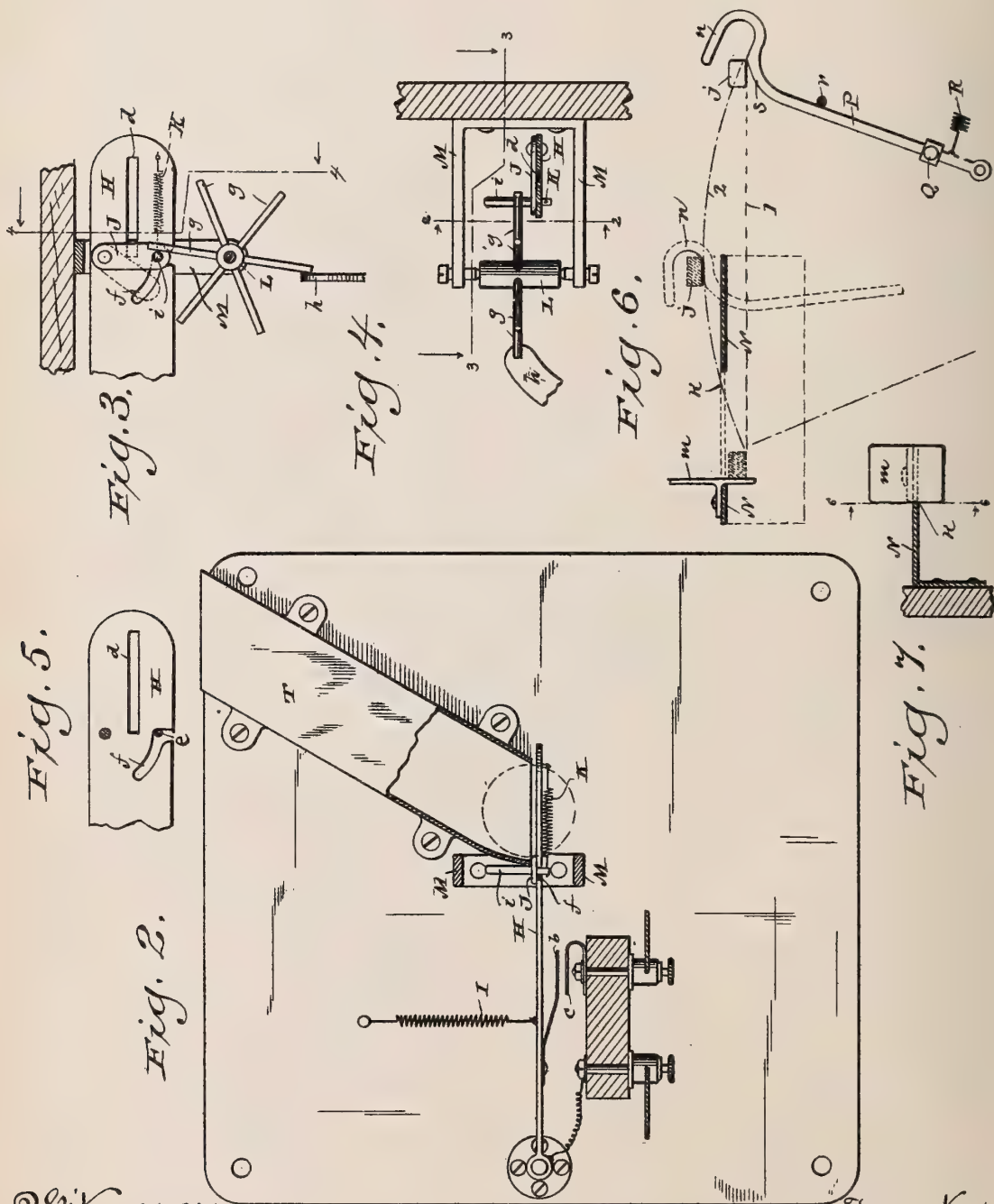
2 Sheets—Sheet 2.

W. S. BURNETT.

COMBINED PHONOGRAPH AND COIN OPERATED MECHANISM.

No. 502,246.

Patented July 25, 1893.



Witnesses
Geo. W. Young.
N. E. Oliphant

Inventor
William S. Burnett
By H. G. Underwood
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM S. BURNETT, OF MILWAUKEE, WISCONSIN.

COMBINED PHONOGRAPH AND COIN-OPERATED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 502,246, dated July 25, 1893.

Application filed August 18, 1890. Serial No. 362,284. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. BURNETT, of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in a Combined Phonograph and Coin-Operated Mechanism; and I do hereby declare that the following is a full, clear, and exact description thereof.

10 My invention relates to combined phonographs and coin operated mechanisms; and it consists in certain peculiarities of construction and combination of parts to be hereinafter described with reference to the accompanying drawings and subsequently claimed.

15 In the drawings: Figure 1 is a diagram view of my invention in perspective; Fig. 2, an elevation partly in section on line 2—2 of Fig. 4, illustrating a coin actuated electric circuit controlling mechanism; Fig. 3, a horizontal section on line 3—3 of the succeeding figure; Fig. 4, an elevation partly in section on line 4—4 of the preceding figure; Fig. 5, a detail plan view of a slot plate that forms part of the mechanism embodied in my invention; Fig. 6, a diagram view illustrating one of the movements constituting part of my invention, said view being partly in section on line 6—6 of the succeeding figure, and Fig. 7, a section on line 7—7 of Fig. 1.

25 Referring by letter to the drawings A represents the cylinder, B the needle-carriage of a phonograph, the cylinder shaft C being belt geared to that portion of an electro-motor represented in Fig. 1, by a shaft carrying a commutator D in contact with conductor plates E, F, the latter being terminals of a suitable system of wiring that connects a battery G, or other electric generator, with a circuit making and breaking mechanism hereinafter described.

30 The circuit making and breaking mechanism just mentioned comprises a plate H of conductive material provided with a contact point *b* opposed to another contact point *c*, and a spring I connected to the plate acts to keep said points normally out of contact. The plate H is provided with a slot *d* proportioned in its dimensions to that of an arbitrarily selected coin and pivotally connected to said plate is a transverse guard J that normally covers a portion of the slot, and this guard is

controlled by a spring K as best illustrated in Figs. 2 and 3. Depending from the guard J is a lug *e* that engages a curved slot *f* cut in the plate H, as best illustrated in Fig. 5.

A hub L has its bearings on a bracket M connected to a suitable support, and radiating from the hub are spokes *g* that oppose arms *h*, *i*, respectively arranged on the needle carriage B of the phonograph and slot-guard J on the spring-controlled plate H, above described. The needle-carriage B of the phonograph is also provided with another arm *j* and parallel to the phonograph-cylinder A is a horizontal plate N having its inner edge recessed at *k* and provided with a stop *m* as best illustrated in Figs. 1 and 7.

Pivotally connected to a suitable support is a lever P provided with a lateral handle Q and having a crook shaped upper end *n* in the path of the arm *j* on the needle carriage said lever being under the control of a spring R connected thereto, as best illustrated in Fig. 1.

In describing the operation of the mechanism, above set forth we will assume that a proper coin S has been deposited in a chute T (shown in Fig. 2) and thereby conducted to the partially closed slot in the plate H as shown in Fig. 1. The weight of the coin overcomes the resistance of the spring I and thus the points *b*, *c*, are brought into contact and to close the motor circuit and thus impart rotation to the cylinder A, the needle and diaphragm-mechanism (not shown) on the carriage B being in position to reproduce the sounds previously recorded on said cylinder. The carriage B being traveled along the cylinder A, the needle is kept in contact with said cylinder by the arm *j* of said carriage moving under the plate N on the dotted horizontal line 1 until it comes into contact with the crooked upper end *n* of the lever P, the latter being normally rested against a suitable stop *r*, as shown in Figs. 1 and 6. When the arm *j* strikes the curve *s* of the crooked end of the lever P, the continued travel of the carriage C causes said arm to ride up into the crook *n* of said lever and thus said carriage is elevated to bring the needle out of contact with the cylinder, while at the same time the carriage-arm *h* comes into contact with one of the spokes *g* on the hub L to thereby partially rotate the latter to cause

another of its spokes to actuate the slot-guard J against the resistance of the spring K, whereby the coin S is permitted to drop through the slot *d* in the plate H, and this plate being freed from weight is drawn back to its normal position by the spring I thus breaking the contact of the points *b, c*, to discontinue the operation. Another coin being dropped into the slot (which in the meantime has been again partially closed by the guard J returned to its normal position by the spring K) the lever P is swung over to the left, by hand, against the resistance of the spring R, this operation causing the carriage-arm *j* to travel on an arc of a circle above the plate N, as indicated by dotted line 2, until it strikes the stop *m* on the same and then when said lever is released, to be automatically returned to its normal position by said spring R, the carriage C will fall so as to permit the needle to again come in contact with the cylinder A and the operation above described is repeated.

It is intended that the mechanism above described shall be inclosed within a suitable case and that the phonograph cylinders shall contain records of musical renditions or other matter suited to the taste or fancy of the public, the reproductions of the cylinder records being effected in the manner above described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a phonograph, adapted to be operated by a motor, of a coin actuated starting and stopping device for the motor, an arm on the needle-carriage of the phonograph, a recessed guard plate provided with a stop and arranged to normally oppose the carriage arm from above the latter, and a shifting lever having a lifting crook in the path of said carriage arm, substantially as set forth.

2. The combination with an electrically actuated phonograph, of contact plates forming terminals of an electric-circuit, a spring for holding one of the plates normally out of contact with the other, a slot in the spring-controlled plate, a spring controlled guard for a portion of the slot, a device for retracting the slot-guard, and an arm on the needle-carriage of the phonograph arranged to actuate said retracting device, substantially as set forth.

3. The combination with a phonograph, adapted to be operated by a motor, of a source of electricity and contact plates in circuit with the motor, a spring for holding one of the plates normally out of contact with the other, a slot in the spring-controlled plate, a spring controlled guard for a portion of the slot, a device for retracting the slot-guard, and an arm on the needle carriage of the phonograph arranged to actuate said retracting device, substantially as set forth.

4. The combination with a phonograph, adapted to be operated by a motor, of a source of electricity and contact plates in circuit with the motor, a spring for holding one of the plates normally out of contact with the other, a slot in the spring controlled plate, a spring-controlled guard for a portion of the slot, a device for retracting the slot-guard, an arm on the needle-carriage of the phonograph arranged to actuate the retracting device, another arm on said carriage and a shifting lever provided with a lifting crook in the path of the latter carriage-arm, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

WILLIAM S. BURNETT.

Witnesses:

N. E. OLIPHANT,
WM. KLUG.

(No Model.)

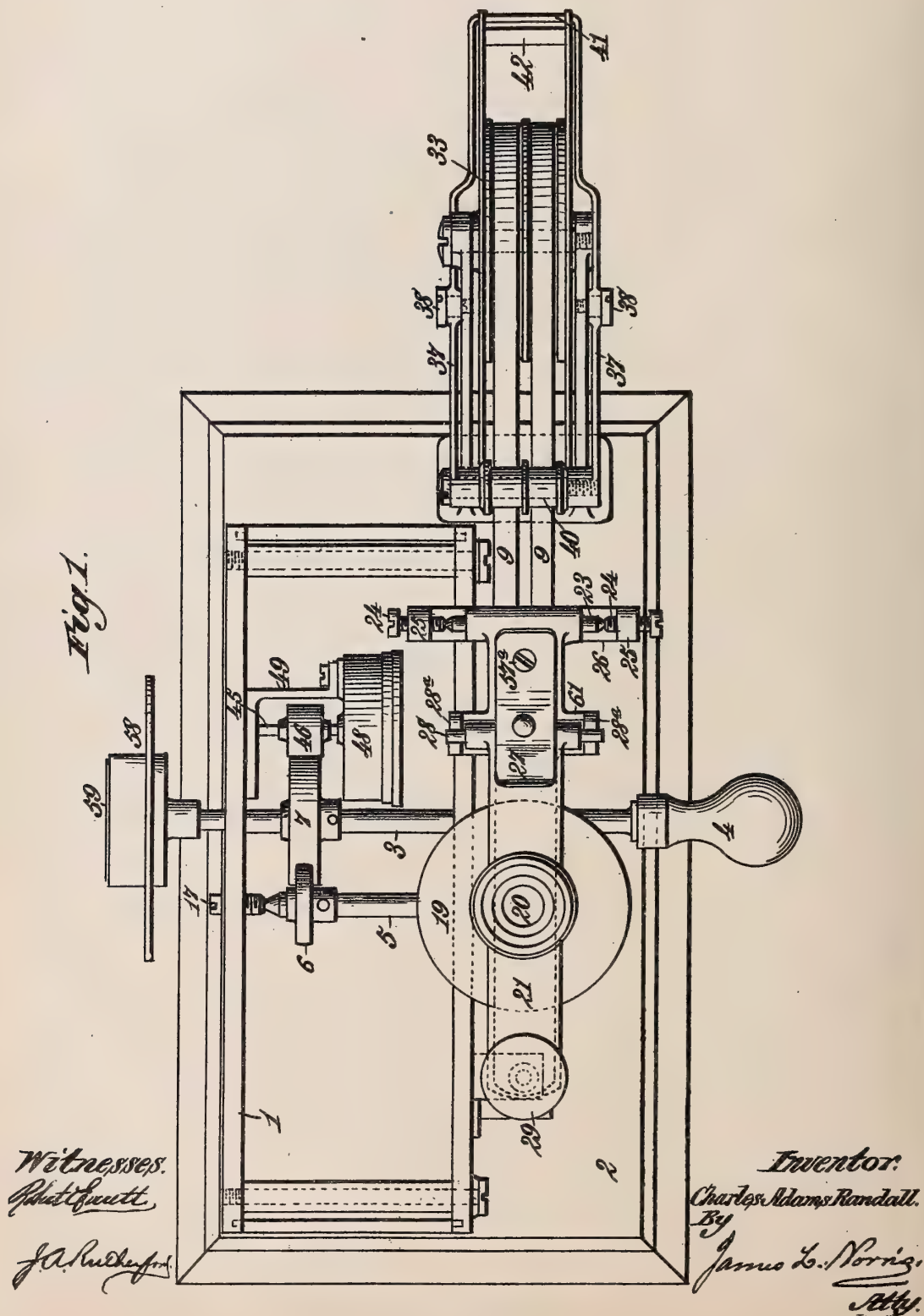
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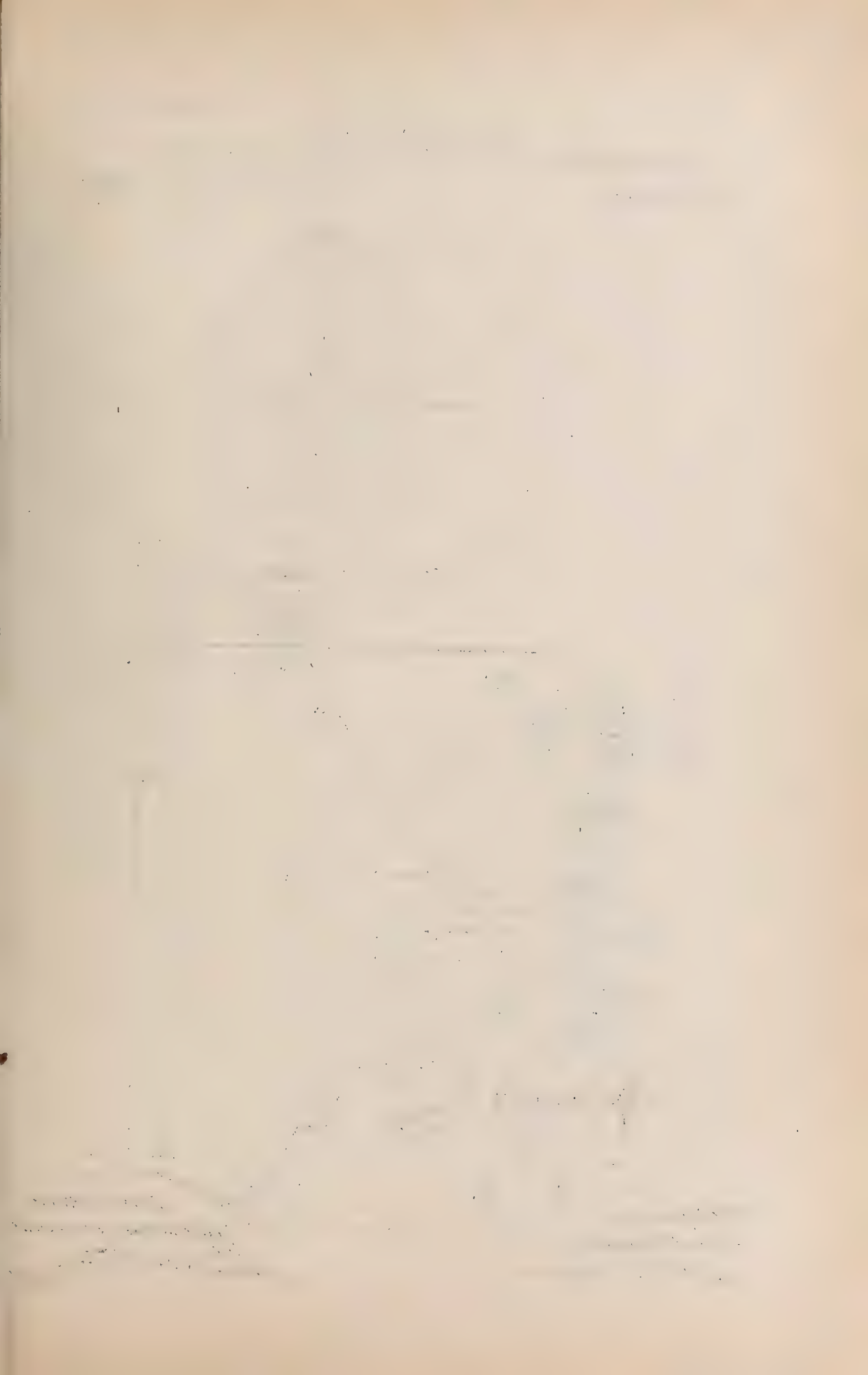
C. A. RANDALL.

APPARATUS FOR RECORDING AND REPRODUCING SPEECH, &c.

No. 502,382.

Patented Aug. 1, 1893.





(No Model.)

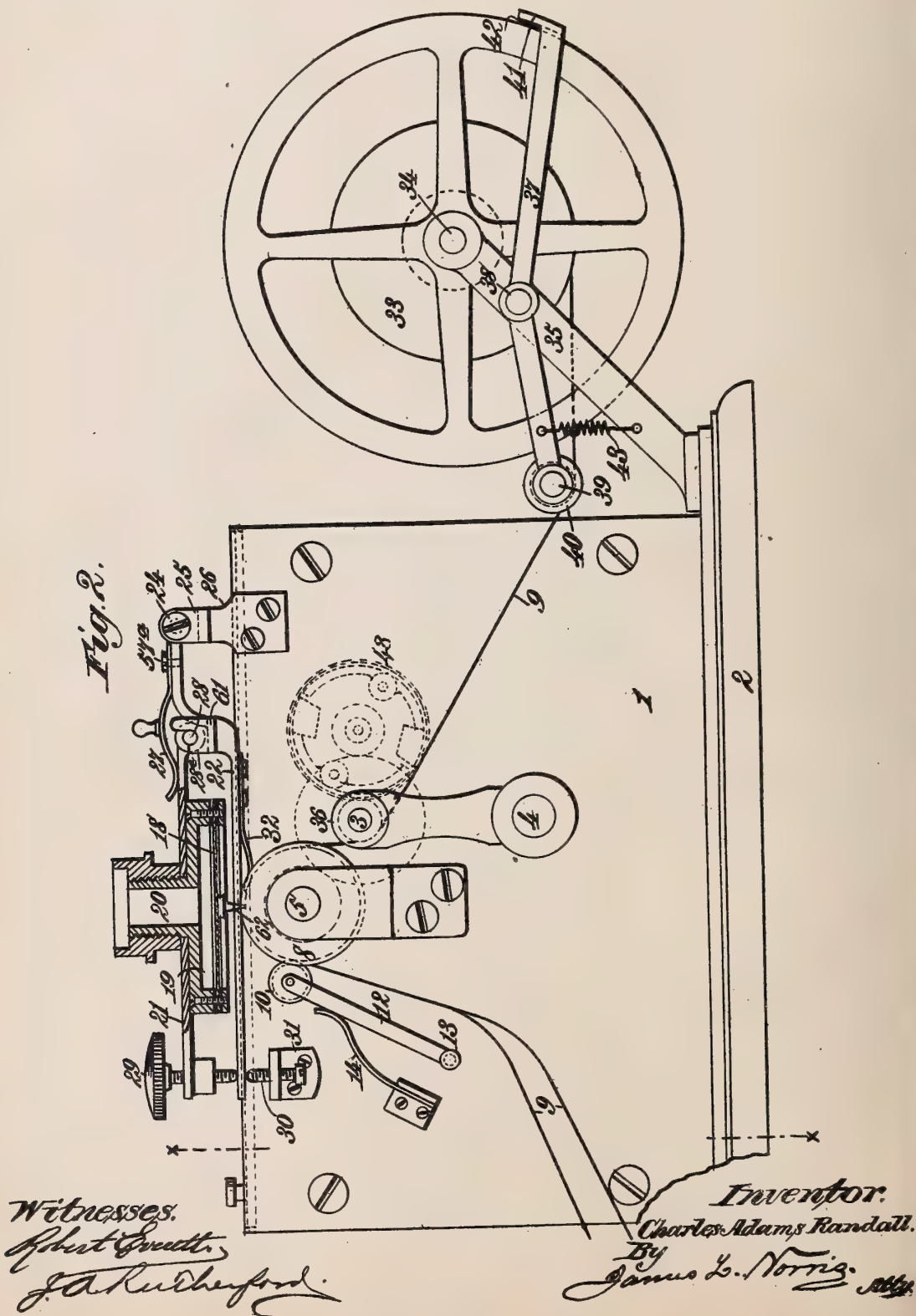
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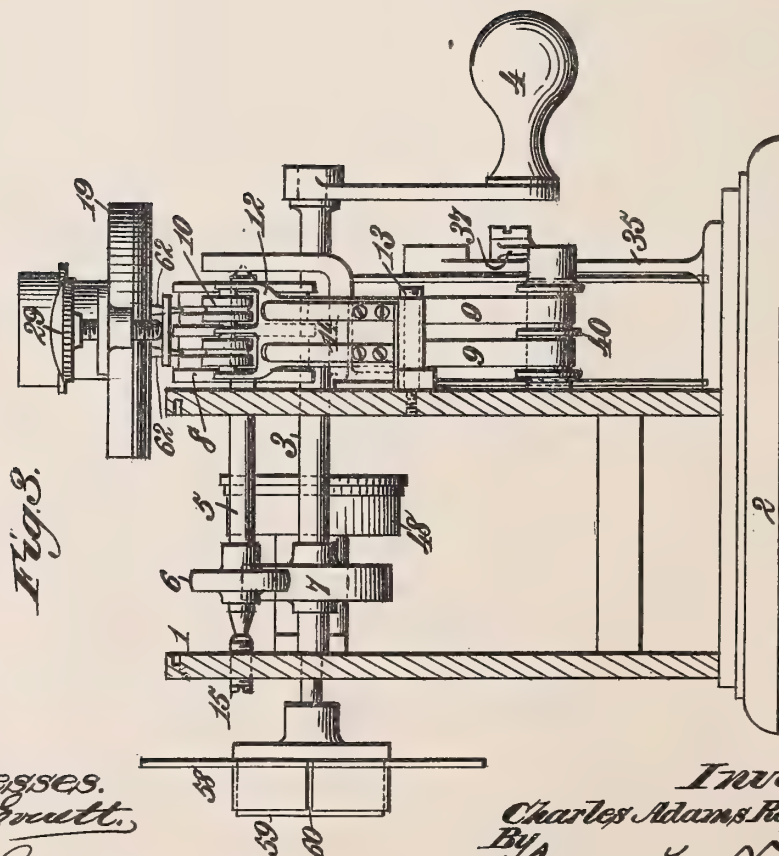
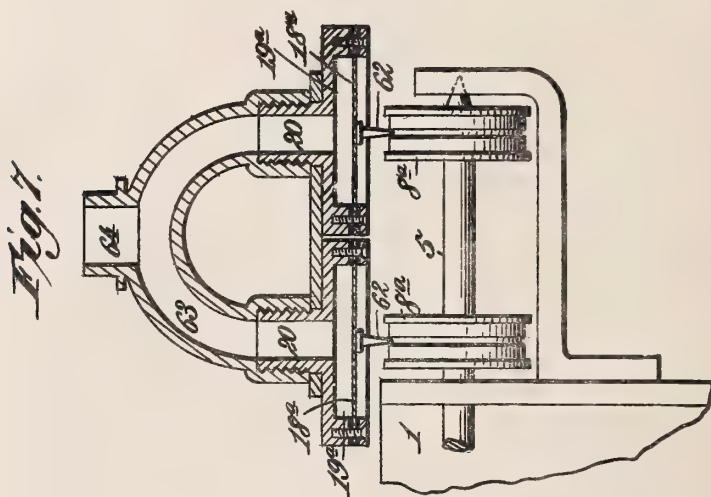
4 Sheets—Sheet 3.

C. A. RANDALL.

APPARATUS FOR RECORDING AND REPRODUCING SPEECH, &c.

No. 502,382.

Patented Aug. 1, 1893.



Witnesses.
Robert G. Pratt.

J. A. Rutherford.

Inventor.
Charles Adams Randall.
By *James L. Norris.*
Atty.

(No Model.)

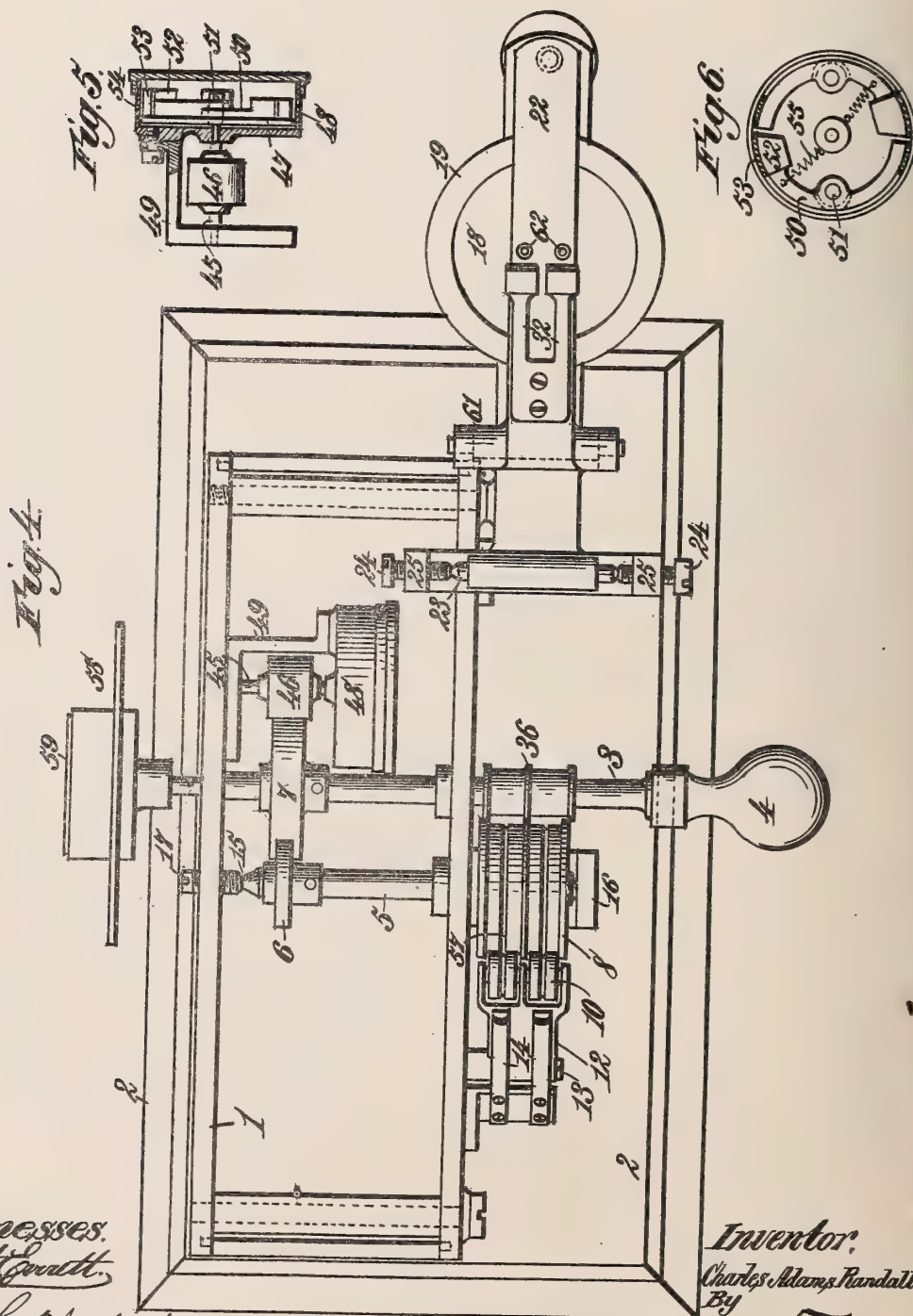
4 Sheets—Sheet 4.

C. A. RANDALL.

APPARATUS FOR RECORDING AND REPRODUCING SPEECH, &c.

No. 502,382.

Patented Aug. 1, 1893.



Witnesses.
John G. Smith.
J. A. Kitchford.

Inventor.
Charles Adams Randall.
By
James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

CHARLES ADAMS RANDALL, OF LONDON, ENGLAND.

APPARATUS FOR RECORDING AND REPRODUCING SPEECH, &c.

SPECIFICATION forming part of Letters Patent No. 502,382, dated August 1, 1893.

Application filed June 11, 1892. Serial No. 436,369. (No model.) Patented in England June 18, 1891, No. 10,357.

To all whom it may concern:

Be it known that I, CHARLES ADAMS RANDALL, a citizen of the United States, residing at London, England, have invented new and useful Improvements in Apparatus for Recording and Reproducing Articulate Speech and other Sounds, (for which I have obtained a patent in Great Britain, No. 10,357, dated June 18, 1891,) of which the following is a specification.

My invention relates to apparatus for recording and reproducing articulate speech, said apparatus being known, broadly, as the phonograph, graphophone, &c.

It is the purpose of my said invention to provide an apparatus of this character which shall be convenient, efficient, and simple, in the construction and operation and by which a plurality of records may be obtained simultaneously, and certainly.

It is an especial object of my said invention to provide for the easy, simple, and economical production of a plurality of records from the same series of phonetic vibrations, one or more of said records being preserved, or retained, while the other passes into the hands of third persons, as is customary, in the methods heretofore in use, in the preparation of business letters and papers, of which press, or carbon copies are formed for retention.

My invention also contemplates and includes the provision of automatic brake-mechanism acting upon the devices by which the record-receiving material is held, in order to prevent it from being paid off too rapidly, and to maintain a practically uniform tension.

It is my purpose, also, to simplify and improve the construction of parts, the organization thereof and the operation of the completed mechanism, and the said invention consists, to these ends, in the novel features of construction and in the new combinations of parts hereinafter fully set forth and then more particularly pointed out and defined in the claims appended to this specification.

To enable others skilled in the art to which my invention pertains to understand and to make, construct, and use the same, I will now proceed to describe said invention fully and

in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a mechanism embodying my invention. Fig. 2 is a side elevation, partly in vertical section, the section plane being in the line $x-x$, in Fig. 1. Fig. 3 is a transverse vertical section upon the line $y-y$, Fig. 2. Fig. 4 is a plan view of that portion of the mechanism exposed to view by removing the top, or cover, of the housing, or casing, and turning back the diaphragm and its supporting-arm. Fig. 5 is a detail section of the speed-governor. Fig. 6 is a front elevation of the parts shown in Fig. 5, the face plate, or front of the casing, or housing, being removed. Fig. 7 is a sectional elevation showing a modified construction.

In the said drawings, the reference numeral 1 indicates the box, casing, or housing, inclosing the greater part of the operative elements of the mechanism, the housing being arranged upon any suitable base 2.

The reference numeral 3 indicates the driving-shaft of the apparatus, which is placed in suitable bearings and crosses the housing transversely to the length of the latter. In the present instance, the shaft is provided with a crank-handle 4, for manual rotation, but I do not confine myself to the use of any specific means for driving the same, as I may employ any mechanical or electrical mechanism suitable for the purpose. In bearings in said housing, near the driving-shaft 3, is a second shaft 5, parallel with the shaft 3, and having mounted thereon a feed-drum 6. Upon the driving-shaft 3, is fixed a friction-wheel, or pulley, 7, which has frictional engagement with the feed-drum 6. The frictionally engaged peripheries of the two parts last named may be, and preferably are, provided with a surfacing of india-rubber, leather, or other suitable material. Upon said shaft 5 is also rigidly mounted a drum, or roll 8, serving as a support for the strips, ribbons, or bands, 9, upon which the phonetic record is made, these strips being held between the drum 8 and independent rolls 10, which are journaled in the forked extremity of an arm 12, pivoted upon a stud 13, and held against the face of the drum by means of springs 14. The drum, or roll 8, has its shaft 5 supported

in suitable bearings, preferably of the type known as cone-bearings 15 one of which rests in a seat in a fixed bracket 16, the other extremity of said shaft being held by a set-screw 17, tapped through one wall of the casing, or housing 1. Over this drum, thus supported, is arranged the diaphragm 18, supported in any preferred and familiar manner in a diaphragm-housing, or chamber, 19, which is provided with a central tube 20, opening into said chamber just behind, or above, the central portion of the diaphragm. This tube passes through an opening in an arm, or bar, by which the diaphragm and its chamber are supported. This supporting arm or bar 21 is pivotally connected at one end to a separate arm 22, which is itself, pivotally mounted upon a shaft 23, having cone-shaped extremities which lie in seats formed in the ends of set-screws 24, tapped through lugs 25 which rise from the ends of a bracket-support 26, screwed to the housing. Upon the second arm 22, is mounted a spring 27, which extends beyond the point of pivotal connection 28, between the two arms, the free end of said spring resting upon the arm 21 and pressing the same downward, the free end of said arm, or bar, being supplied with an adjusting and sustaining set-screw 29, which is tapped through a boss on the arm. The point of this screw rests upon the arm 22, which, after dropping somewhat below the point of pivotal connection 28, is extended beneath, and in substantial parallelism with the diaphragm, to a point on the other side thereof, where its end lies beneath the point of the screw 29, (Fig. 2.)

Below the end of the bar 22, and substantially in line with the set-screw 29, is a second set-screw 30, tapped through a bracket 31 and presenting an upwardly turned, conical point, which engages the lower surface of the arm 22. These two set-screws act in unison in the support given to the arms, or bars 21 and 22, and by their reciprocal adjustment the diaphragm may be placed in any required relation to the surface of the drum 8. The bar 22 passes between the latter and the diaphragm, and out of contact with either. One function of said bar is to sustain leaf-springs 32, fastened by one end to the lower surface of the bar, and having their free ends resting upon the record-receiving material as the latter is fed by the drum. These spring-pads have comparatively light tension and by their action give stability and steadiness to the material they act upon.

The record-receiving material is formed, preferably, in the form of tapes, ribbons, or strips, and is wound upon reels, or spools 33, which are mounted upon a shaft 34, the journals of which lie in bearings in inclined brackets 35, mounted upon the base-piece 2. The tapes, strips, or ribbons, are taken from said spools and carried around a guide-roll 36, upon the driving shaft 3. From this roll they pass to the drum 8, and are carried over the top of

the latter and between its face and the two frictional feed-rolls 10.

To avoid too rapid pay-off, or unwinding, from the spools, or reels, 33, I provide a brake-lever 37, which is mounted upon a pivot 38 on the brackets, or arms, 35. The lever 37 consists, essentially, of a frame, the parallel arms of which lie close to the outer faces of the brackets 35, the ends which lie next the base-piece 2, being connected by a spindle, or shaft, 39, upon which is mounted a guide-roll 40, beneath which the record-receiving tapes, ribbons, or strips, are conducted in passing to the guide-roll 36. At their opposite ends, the lever-arms 37 are connected by a friction-plate 41, which lies close to, and in comparatively light frictional contact with, the periphery of the spool which carries and pays off the record-receiving material. The friction-surface of the plate 41 is preferably composed of a material 42, of any suitable kind, its choice being controlled, in a measure, by the particular effect desired; such, for example, as the production of a maximum resistance with the minimum of power expended on the lever, &c., the selection of such material being a matter which can be left to the judgment of those skilled in the art.

The brake-lever is actuated by a spring, or springs, 43, connected thereto and to the shaft-supporting brackets 35. The stress, or tension of this spring is quite light and it acts on the lever with a downward pull, or draft, thereby having a tendency to carry the guide-roll 40 downward. When the tension of the record-receiving strips, bands, or ribbons 9 is normal, which will be the case so long as the speed of revolution of the spools 33 is not excessive, the slight pull, or tension, under which the said strips are maintained, will have sufficient action upon the guide-roll 40 to overcome the stress of the spring 43, and the friction-plate 41 will, by the slight turn thus given to the lever, be drawn away from the periphery of the spool. Should the tension, or draft, exerted upon the ribbons, or strips 9, be relaxed, however, by the too rapid pay-off of the spools, the spring 43 will act and the lever 37 will be slightly turned upon its fulcrum, bringing the friction-plate down on the spool and checking, or retarding its movement, until the proper equilibrium is restored.

Upon a shaft 45, mounted in suitable bearings in the casing, or housing, 1, is fixed a pulley 46 to revolve the shaft and operate a speed-governor. The latter consists of a disk 47, revolving in a cylindrical shell, or housing 48, which is rigid upon a supporting bracket 49, and forms a support for one end of the shaft 45. Upon the flat face of the disk 47 are pivotally mounted curved lever-arms 50, extending upon opposite sides of their pivotal attachments 51, and provided with weights 52, which are, in each lever, attached to one arm thereof. It will readily be seen that, by the rotation of the disk 47, the weights 52 will

be thrown outward by centrifugal force, and as they are provided upon their faces with pads 53, of leather, or other suitable material, these will be pressed against the flanges 54 of the casing with a frictional contact proportioned to the centrifugal force exerted. The weights 52 simply increase the effects produced, and may, or may not be used.

In some instances it may be desirable to exert some force upon the frictional pads 53, or on the arms carrying them, to draw said pads away from the flange 54. This may be accomplished in different ways, but one simple method is to connect the ends of the curved arms 50 by means of light springs 55, which may be made adjustable to vary the force exerted. I have indicated this elastic connection, in Fig. 6, by means of dotted lines, but I do not, in any particular, restrict my invention to the use thereof, or to any specific feature of the same.

The automatic speed governor is operated by the frictional engagement of the pulley 46 with a larger friction-gear 7 upon the driving-shaft. As this speed-governor is a separate invention, relatively to the subject-matter of this application, I make no claim thereto, herein, my rights, in this respect, being relegated to a future and separate application for Letters-Patent.

I find it, in practice, advantageous to form circumferential channels 57 in the drum 8, one of said channels being provided for each strip of record-receiving material. Channels or grooves of the same kind are also formed in the spring-pressed rolls 10, as shown in Figs. 2, 3 and 4, said channels, as well as those in the drum 8, being in the vertical plane of the recording-styles, whereby the lines of record are not subjected to surface-contact, or pressure. In the absence of such channels, I preferably cover the drum with a composition of soft rubber and other suitable materials, so that the strip will be supported during the process of recording. Many compounds and some materials are well known to those skilled in the art, which will answer the purpose proposed, without offering any material resistance to the action of the recording stylus. The strips, or ribbons 9, after receiving the record, may be wound spirally, either for transmission by mail, or otherwise, or for filing as retained copies. To facilitate this winding, I provide a flanged reel 58, which may be mounted upon a reel-holder 59, mounted on the prolonged extremity of the driving-shaft, outside the housing 1. This reel-holder consists of a simple cylindrical body, upon which the reel 58 is slipped, a dividing cut 60 being formed therein, to enable it to expand somewhat and grasp the reel-holder, as seen in Fig. 3.

As it may, in some cases, be desirable to provide interchangeable diaphragms, I mount the pivotal connection 28, by which the two supporting-arms 21 and 22 are united, in open seats, or bearings, 28^a, of V-shape. These

seats are formed in upwardly turned lugs 61, upon the end of the supporting arm 22, and the pivotal bearing is held in said seats by the leaf-spring 27. The arm 21, together with the diaphragm, its housing, or chamber, and the other adjuncts of said arm, may be readily and instantaneously detached by simply turning the spring 27 upon its pivotal attachment 57^a. This will enable the operator to substitute for the diaphragm and stylus used in recording, a different and more sensitive diaphragm, for purposes of reproduction. In many instances, also, the form of stylus used in reproducing is somewhat modified, as compared with the recording-stylus, as many persons consider the use of a special form of reproducing stylus to be advantageous. In such cases, the required form may be substituted for the recorder quickly and accurately, by the construction I have set forth.

I have shown in the drawings a single diaphragm 18, having two styles 62, of any suitable form. I propose, however, to use, in some instances, two independent diaphragms 18^a, (Fig. 7,) each having its own, independent housing, or chamber 19^a. These parts are mounted upon the supporting arm 21, in the same, or in substantially the same manner as the single diaphragm, the chief difference being that the said supporting-arm is of greater width, in order to accommodate two diaphragms instead of one. The tubes 20 are united by a curved, or yoke-shaped tube 63, with a single sound-conveying tube 64, for attaching the concentrator, not shown in the drawings, these being of the ordinary form. In this or similar forms of construction I use the same diaphragms or vibrators and their respective styles or points both for recording and for reproducing, and they may be used simultaneously for recording in duplicate, or for reproducing from the same or different records at the same time, or one only for recording and simultaneously therewith one for reproducing from the record as it is being made or from a separate record, or in various other ways.

The record-receiving material may consist of waxed paper, tin-foil, or other material suitable for the purpose, but I prefer to employ paper, silk, or some similar material for the base, and coat the same with wax, with or without one or more longitudinal grooves, or crimps, formed therein and faced with highly burnished tin-foil. This strip of metal, when combined with waxed paper or other fibrous material, is very useful for the purposes mentioned, the tin-foil at the parts above the said groove, or crimp, being very easily indented by the recording stylus, while the paper, or other base, serves to support and strengthen the tin-foil, and thus diminish the liability of folding, or breaking, the same. The groove, or crimp, one or more, may, if preferred, be formed in the coating of wax, on the strip of paper, or other material, or the base may be

smooth and without any groove, or crimp, whatever.

It is evident that the record-receiving strip may, if necessary, be used singly, upon the mechanism described, or it may be used in duplicate, two or even more of such strips being employed.

What I claim as my invention is—

1. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with a plurality of recording styles, of a corresponding number of independent, flexible strips, ribbons, or bands, of record-receiving material, a pulley supporting the said material and having a plurality of grooves or channels lying in the planes of the recording styles, means for rotating said pulley to feed the strips simultaneously to the recording styles, and spring-pressed rolls holding the said strips, or ribbons upon said supporting pulley, said rolls being provided with peripheral grooves, or channels, lying in the plane of the recording styles, whereby said strips are free from surface-contact, or pressure, along the lines of record, substantially as described.

2. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with a plurality of independent recording styles of a single diaphragm operating the same means for supporting and simultaneously feeding a plurality of record-receiving strips, or ribbons, a pulley having a plurality of grooves or channels lying in the vertical planes of said styles to support the strips and give feed-movement thereto, and spring-pressed rolls bearing upon said strips after they have passed beneath the styles said rolls being provided with channels or grooves lying in the vertical planes of the styles, whereby the lines of record are free from surface-contact, or pressure, substantially as described.

3. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with one or more rotating drums, supporting a plurality of strips, bands, or ribbons each adapted to receive a record, simultaneously, of a plurality of recording styles, a pay-off roll, from which said strips, bands, or ribbons, are taken, a lever fulcrumed between its ends and bearing upon one extremity a guide-roll, or rolls, pressed by the paid-off strips in one direction and by a spring in the other direction, and provided at its other extremity with a friction-plate lying near the periphery of the reel, with which it is engaged by the action of the spring, when the tension of the record-receiving strips is relaxed, substantially as described.

4. In an apparatus for recording and repro-

ducing articulate speech and other sounds, the combination with the recording devices of means for supporting and feeding the record-receiving material, a spool from which said material is paid off, an automatic friction-brake, consisting of a spring-engaged lever having a friction-plate on one end and a guide-roll on the other end, engaged by the paid-off strip or strips of material, and an automatic speed-governor on a driving-shaft, consisting of a disk, rigid on said shaft, lever-arms fulcrumed thereon, and a fixed flange against which friction-pads on said arms are projected with a bearing proportioned to the centrifugal force developed, substantially as described.

5. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with means for supporting and feeding the record-receiving material, of a diaphragm having a chamber, and having a removable and interchangeable supporting-arm, having a pivotal connection, and a permanently pivoted arm having seats for said connection, substantially as described.

6. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with means for supporting and feeding the record-receiving material, of an interchangeable supporting arm carrying the diaphragm and style, and an arm supporting the interchangeable arm, the latter of said arms having pivotal hinged connection with the frame of the machine, and the former of said arms being pivotally connected with or hinged to the latter arm, substantially as described.

7. In an apparatus for recording and reproducing articulate speech and other sounds the combination of one or more rotating drums or rollers, over which the material in ribbon-form is fed by the aid of friction-rollers, means for holding and guiding the material, and means for recording the sounds thereon or reproducing the sounds therefrom in duplicate or otherwise, substantially as described.

8. In an apparatus for recording and reproducing articulate speech and other sounds, a rotating support over which the material is frictionally carried, provided with a circumferential groove or channel substantially as shown.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES ADAMS RANDALL.

Witnesses:

GEO. J. B. FRANKLIN,

F. J. OSMAN,

Both of 17 Gracechurch Street, London, E. C.

(No Model.)

3 Sheets—Sheet 1.

C. A. RANDALL.
APPARATUS FOR RECORDING AND REPRODUCING ARTICULATE SPEECH.
No. 502,383.

Patented Aug. 1, 1893.

Fig. 1.

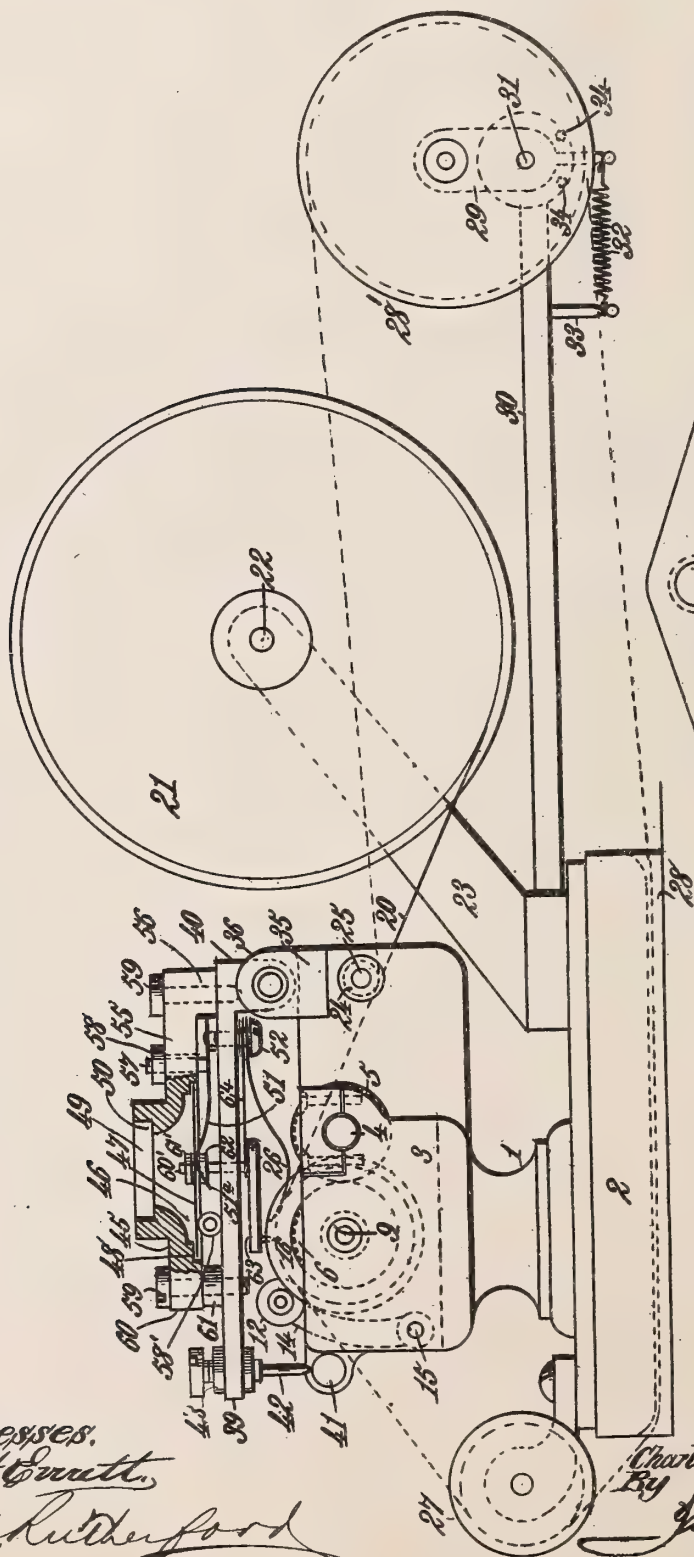
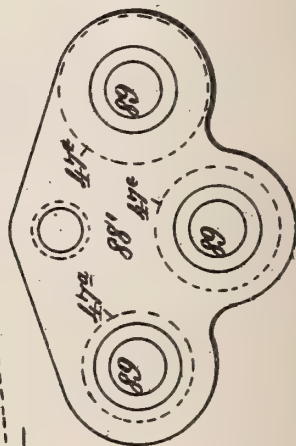


Fig. 14.



Witnesses.
Robert Smith,
J. A. Rutherford

Inventor,
Charles Adams Randall.
By James L. Norris,
Atty.

(No Model.)

3 Sheets—Sheet 2..

C. A. RANDALL.

APPARATUS FOR RECORDING AND REPRODUCING ARTICULATE SPEECH.

No. 502,383.

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Fig. 2.

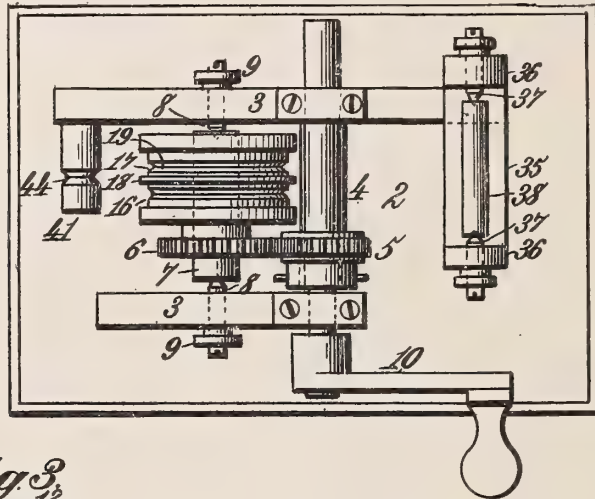


Fig. 3.

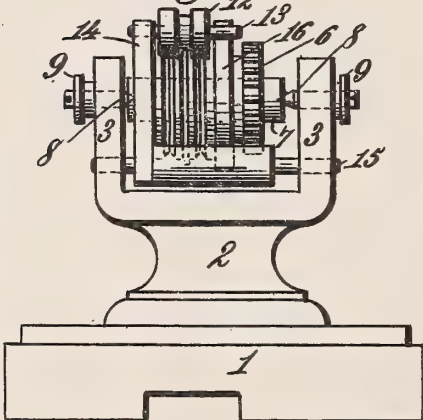


Fig. 4.



Fig. 5.

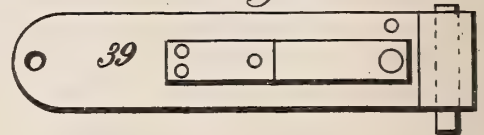


Fig. 6.

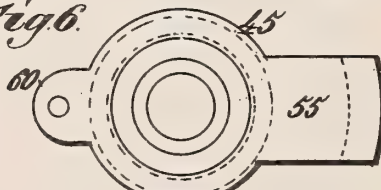


Fig. 7.

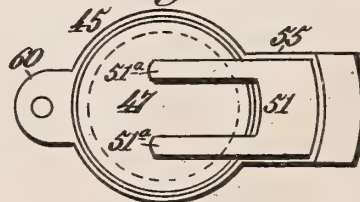


Fig. 9.

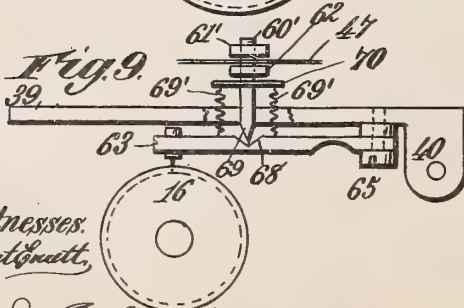
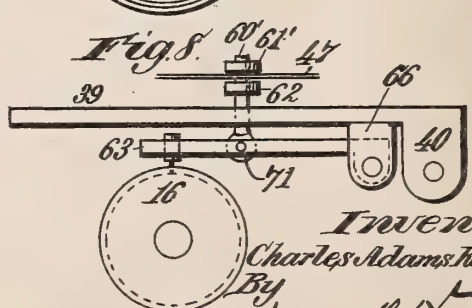


Fig. 8.



Witnesses.
Phel Guatt.

J. A. Lutherford

Inventor.
Charles Adams Randall
By
James L. Norris.
Att.

(No Model.)

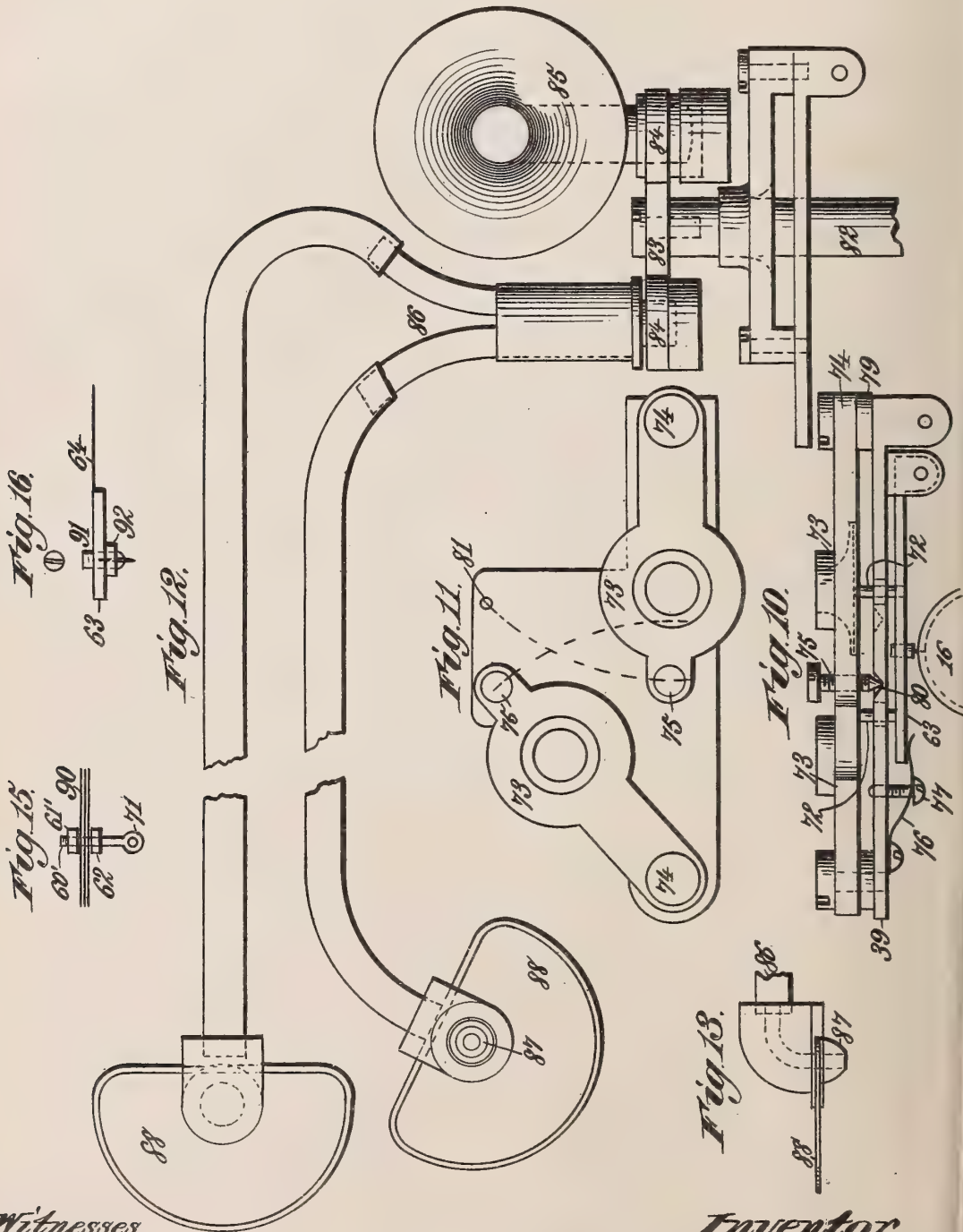
3 Sheets—Sheet 3.

C. A. RANDALL.

APPARATUS FOR RECORDING AND REPRODUCING ARTICULATE SPEECH.

No. 502,383.

Patented Aug. 1, 1893.



Witnesses.
Phil. G. Smith.
J. A. Rutherford.

Inventor.
Charles Adams Randall.
By J. W. L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

CHARLES ADAMS RANDALL, OF LONDON, ENGLAND.

APPARATUS FOR RECORDING AND REPRODUCING ARTICULATE SPEECH.

SPECIFICATION forming part of Letters Patent No. 502,383, dated August 1, 1893.

Application filed August 25, 1892. Serial No. 444,105. (No model.) Patented in England March 14, 1892, No. 4,971, and June 20, 1892, No. 11,476.

To all whom it may concern:

Be it known that I, CHARLES ADAMS RANDALL, a citizen of the United States, residing at London, in the Kingdom of Great Britain, have invented new and useful Improvements in Apparatus for Recording and Reproducing Articulate Speech and other Sounds, (for which I have obtained patents in Great Britain, No. 4,971, dated March 14, 1892, and No. 11,476, dated June 20, 1892,) of which the following is a specification.

My invention relates to phonographic mechanism and the purpose thereof is the provision of simple means whereby an accurately responsive vibration may be given to the recording and reproducing styles, or points.

It is my purpose, also, to simplify and improve the construction and operation of mechanism of this type, to prevent the danger of false vibrations of the diaphragm actuating the recording stylus, or point, to provide means for the better and more accurate feed of the record receiving material and in other respects to provide an improved construction of the individual parts and novel combinations of said parts.

To enable those skilled in the art to understand and to make, construct, and use my said invention, I will now proceed to describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional side elevation of a phonautographic mechanism organized in accordance with my invention. Fig. 2 is a plan view of the same, the pay-off reel being removed. Fig. 3 is an end view of said mechanism taken from the left hand of Fig. 1. Fig. 4 is a detail view of the pivotally mounted diaphragm-supporting plate. Fig. 5 is a bottom plan view of the same, showing the lever carrying the recording or reproducing styles, or points. Fig. 6 is a plan view of the diaphragm-frame, or housing. Fig. 7 is a bottom plan view of the diaphragm with the adjustable, tension-changing device. Fig. 8 is a detail side elevation of the diaphragm-supporting plate and style-carrying lever, showing a modification in construction. Fig. 9 is a further detail view showing an additional modification. Fig. 10 is a side elevation of the same parts, showing a construction adapt-

ed to the use of a plurality of styles and of diaphragms. Fig. 11 is a partial plan view of the parts shown in Fig. 10. Fig. 12 is a detail side elevation, showing the concentrator, or mouth-piece, and the ear-tubes, or trumpets. Fig. 13 is a detail view showing a feature of construction of the ear-attachments. Fig. 14 is a plan view showing a modified form of diaphragm-supporting plate. Fig. 15 is a detail view showing a special construction of diaphragm. Fig. 16 is a detail view showing one form of stylus.

The reference-numeral 1 in said drawings indicates a pedestal support for the essential parts of the phonograph, said pedestal resting upon a base 2 of any suitable form, both parts being constructed of wood, metal, or any other material suitable for the purpose. Upon the two sides of the pedestal nearest the longer sides of the base 2, are formed, or mounted, two vertical plates 3 rising to suitable height above the top of the pedestal. In the vertical plates 3, not far from their central upper portions, is mounted the principal shaft 4, upon which a driving pulley 5 is made fast. This pulley is geared, preferably by friction, with the face of a driven pulley 6, fast upon a shaft 7 which is usually supported by cone-bearings 8, which are adjustable in the plates 3 and provided with jam-nuts 9, or other suitable means, whereby they may be securely fastened after the proper adjustment is made. Revolution is given to the shaft 3 by any suitable means, such as a crank 10, although I usually substitute some approved type of mechanical power, such, for example, as the electric motor adapted to the operation of the phonograph, or graphophone. Said revolution is imparted, through the pulley 6 and shaft 7, to rolls 12, having comparatively small diameter, and geared with the roll 6 by friction, only. Said friction-rolls are mounted upon a shaft 13, having support in the ends of arms 14, which are pivotally supported at their other ends by a rod, shaft, or bar 15, supported in the vertical plates 3 at or near the ends thereof which lie upon that side of the shaft 7 most remote from the driving shaft, or principal shaft 4. The small friction-rolls 12 rest upon the face of a roll 16, carried by the driven-shaft 7, and having

a face of considerable width, in which are formed two peripheral seats 17, separated by a central rib, or flange 18. Each of these seats is wide enough to readily admit one of the friction-rolls referred to, and allow it to revolve therein by friction contact, the latter being preserved by means of spring-pressure. A circumferential channel, or trough 19 is cut in each seat in the center of the same, or substantially so.

The record-receiving material, is preferably in the form of a ribbon, or ribbons, 20, and is taken from a reel 21, having support upon a shaft, or spindle, 22, mounted in the end of an inclined bracket 23, attached to the base-plate 2. I prefer to use this material in duplicate, by employing two similar strips, or ribbons, which will be led from reels similar to the reel 21 over the top of the roll 16, in the circumferential seats of which the said strips, or ribbons, lie, passing between said roll 16 and the friction-rolls 12. In passing from the reel 21, the material will be brought under a guide-roll 24, which has journal-support upon a stud 25, having support in one of the plates 3, in order that it may, at all times, have the same tangential relation to the roll 12, without material variation of its angle of inclination by the reduction in diameter of the coil of strips, or ribbons, on the reel 21, as the same are paid off by said reel. As the material comes upon the pulley 16, it passes beneath a spring presser-foot 26 which exerts a moderate pressure thereon at a point near the stylus. This presser-foot may, and preferably does, serve as a burnishing, or smoothing device, acting upon the record-receiving material as the latter passes beneath it, and before it reaches the point where it is acted upon by the recording or reproducing stylus. When this material is in simple ribbon-form, it passes, after receiving the record, or after reproducing the same, into any suitable receptacle, such as a basket, or, if preferred, it may be rewound upon a separate reel. It will be understood that this form is in contradistinction to long bands, or ribbons of such material, which are not endless, but are simply wound upon the reel, or reels 21. When used, however, in the form of continuous bands, or filaments, it passes from the pulley, or spool, 28', (the reel, or reels, 21 being removed,) under the roll 25, thence beneath the presser foot, 26, then over the pulley, 6, over the guide-pulley 27, and then passes beneath the base-plate of the machine. After leaving the pulley 16, the material passes over a guide-roll 27, if used in the form of continuous bands, and thence goes beneath the base-plate 2, which is provided with suitable channels, or guide-ways, 28, to guide the endless band, or bands, back to the pulley from which they are paid off. When using material of this form I prefer to use a pulley 28' instead of the reel 21. This pulley 28' is journaled in the upper end of a post 29,

pivoted in an extension-piece 30, projecting from the end of the base-plate 2. The pivotal axis 31 of the post 29 is horizontal, or practically so, and the reduced end of the post extends below the said axis and provides a means of attachment for one end of a spiral spring 32, the other end of which is attached to a rigid support 33. The tension of this spring draws the journal supports of the pulley 28 toward the right-hand, as seen in Fig. 1, and thereby affords a steady, uniform tension for the record-receiving material, which may be varied in any manner and to any degree required. The pivotal movement of the post 29 is limited by two stop-pins 34, between which the lower portion of said post turns.

Upon one of the vertical plates 3, immediately above the guide-roll 24, is mounted a bracket 35, having opposite lugs 36, (Fig. 2) in which are arranged cone-bearings 37, which give support to the ends of a shaft 38, either of solid or tubular form, and having suitable recesses in its ends to permit the engagement of the cone bearings.

The shaft 38 gives support to a swinging plate 39, having lugs 40, at one end, said lugs projecting at right angles with the flat, lower face of the plate and having openings which receive the shaft 38. The plate 39 extends over the pulley 6 and friction rolls 12, its length being such that its free end overhangs a fixed bar 41, rigidly mounted in the vertical plates 3. Through the end of the plate 39 is passed an adjustable stop-pin 42, the point of which has bearing upon the fixed bar 41, and affords support to the said plate, the stop-pin being rendered adjustable by means of nuts 43 turned thereon, one above and the other below the plate. The fixed bar 41 is provided with a groove, or circumferential channel 44, which receives the end of the stop-pin 42.

Upon the plate 39 is mounted the diaphragm carrier, which consists substantially of a housing, or frame 45, having a suitable diaphragm-chamber 46, lying above the diaphragm 47, which is arranged in an annular, undercut recess, or seat 48. Above the diaphragm-chamber, or in the upper part of the same, is formed a concentric opening 49 having a seat 50 for the insertion of a mouth-piece, or concentrator, or for the attachment of the sound-conducting tubes, trumpets, or other devices.

The diaphragm 47 is not positively secured in the seat 48 provided for it, but is held in place by an elastic strip, or filament 51, rigidly attached at one end to the plate 39 by a screw, or bolt, 52, which also holds the presser-foot 26. At its other end the elastic strip or filament 51 is bifurcated, or provided with arms 51^a arranged on opposite sides of the center of the diaphragm 47. Projecting from one side of the diaphragm housing, or frame, 45, is a tongue, or plate 55, which extends to, or nearly to, the end of the plate 39, where it has a downwardly projecting lip, or extension 56,

resting upon the plate. Between this point and the diaphragm-chamber 46, is a threaded pin 57, which is passed through the tongue 55 and has its lower end affixed to the elastic strip, or filament 51, a nut, or equivalent device 58 being turned upon the end of said pin rising above the plate. By adjusting this nut the pin 57 may be raised, or lowered, and the diaphragm 47 may be thereby placed under tension to any required degree; or, on the other hand, it may be released so far as to restore its highest sensitiveness and maximum amplitude of vibration. In order to deaden, destroy, or prevent false vibration, one or more dampeners 58' may be used, formed of any material suitably irresponsive to phonetic vibration. I have found that a short piece of elastic, or flexible, rubber-tubing, of suitable diameter, will answer the purpose proposed excellently, and the damper shown in Fig. 1 is of this character.

The diaphragm-frame, or housing 45 is secured to the plate 39 by screws 59, one passing through the tongue 55, and lip 56, and the other through a lug 60, opposite said tongue. A washer nut 61 is placed beneath the lug 60, to supply the place of a lip similar to the extension 56, upon the tongue 55.

The connection between the diaphragm 47 and the recording point, or style, is a matter of much importance, as there should be the utmost freedom of movement and all danger of causing lost motion must be carefully avoided. I regard it as desirable, also, that the style be carried by a lever, intermediate of said style and the diaphragm, to increase the amplitude of vibration of the recording point. It is important, also, in order to obtain the best results, that the connection between the style and the diaphragm be of a certain rigid character, but without imposing strain or tension upon the diaphragm, or upon any part, or parts thereof, in excess of any other part, or parts, should the circumstances of the case render it impossible to entirely avoid the imposition of strain, or tension upon said diaphragm, which should possess the maximum sensitiveness to all phonetic vibrations. I prefer to make the connection of these parts by means of a post 60' having one end passing through the diaphragm 47 at, or near, its central point and connected thereto by two nuts 61' and 62, both turned upon the threaded end of the post one below and the other above the diaphragm. The other end of the post 60' hangs below the diaphragm and is suitably connected to a lever 63, the point of connection being quite near one end, which projects from said point toward the pivotally supported end of the plate 39, just far enough to afford a secure attachment for the end of a flat-leaf-spring 64, which is rigidly mounted by one end upon the under side of the plate 39, quite near the pivotal end thereof, where it is secured by means of a screw 52, the latter also forming the means of attachment of the presser-foot or burnisher

26. The post 60' may, if preferred, be attached to the diaphragm 47 by cement, in lieu of the means described. In this case, the nuts 61' and 62 may be applied to the lower end of the post, one above and the other below the lever 63.

A substitute construction of the parts last described is shown in Fig. 8, in which the lever 63, on which the style is mounted, is given pivotal support upon drop-brackets, or lugs, 66, by cone-bearings, or other suitable means. In this modified form I consider it preferable to arrange the point of connection of the post 60' at, or about, the same distance from the point of connection to the plate 39 shown in Fig. 1, the main difference being that the lever 63 is continuous between said points, in place of the flexible, elastic connection 64. The latter may be dispensed with, however, and the lever may be continuous, as described above, its end being secured by the screw or bolt, 65, in the same manner as the leaf-spring 64. To provide for the required elasticity, in the absence of the said leaf-spring, the body portion of the lever may be cut away, Fig. 9, or the entire end of the lever may be reduced in thickness to any desired, or suitable degree. In this substitute form the lever is provided with a V-shaped notch, or cone-shaped seat 68, which receives the pointed, or tapered end 69 of the post 60'. A suitable clearance of the contacting parts is provided, in order to permit a slight rocking movement, or change of angularity, may be made as the post and diaphragm partake of the vibratory movement of the diaphragm. The post 60' is held in engagement with its seat 68 in the lever by means of springs 69' one or more, of light tension. The post will be preferably secured to the diaphragm 47 by means of nuts 61' and 62, as already described. If more than one spring 69' is used to hold the post in engagement with its seat 68, their upper ends may be connected to cross-pin, or to a light spider 70, which is mounted on the post 60' beneath the lower nut 62, the other ends of said springs being connected to the lever in any suitable manner. I may, however, without any material variation, use a single spring, of slightly greater force, to make the connection last mentioned. In this case the spring will preferably be of such diameter that it will surround the post at a proper distance therefrom, in order to exert its force without any interference with the slight oscillation, or change of angularity of said parts, as the diaphragm and post rise and fall and raise and depress the end of the lever which carries the style, or styles.

In Figs. 8, 10 and 11 I have shown certain modifications of these parts. In Fig. 8 the stylus is carried by the lever, as already described, but the post is connected to the diaphragm by means of nuts, 61' and 62, one on each side the diaphragm. The post 60', in this construction, is connected to the lever 63 by means of a pivot joint 71. In Fig. 10 I have

shown the style-supporting lever 63 as provided with two upright studs 72, which pass freely through the arm 39, which supports the diaphragms. In this form I contemplate the use of a plurality of diaphragms, both carried by the plate 39. Said diaphragms are arranged in housings 73, which have pivotal attachments 74 to the plate 39, their free ends being provided with adjusting screws 75, whereby the exact degree of impact of the diaphragms upon the ends of the upright studs 72 may be made. A damper-spring 76 is provided, mounted on the under side of the plate 39 and having its end bearing beneath the free end of the lever 63. A tension-adjusting screw 77 is provided, also, to enable the operator to increase the tensional action. In this form the diaphragm-housings 73 are mounted on the diaphragm-carrying plate 39, by means of the pivotal connections 74, an interval of separation being obtained by means of washers, or nuts, 79, placed upon the screws between the two. In order to place the diaphragms correctly seats 80 are formed in the plate 39, in which the points of the adjusting screws 75 will rest. Either diaphragm may thus be swung into, or out of, position for service. Similar seats 81 may be formed at suitable points to permit the like engagement of the points of said screws when the housing 73 is swung into such position as to render the diaphragm inoperative.

I provide, in some instances, a post 82, which rises from the base 2, and supports a pivotally turning piece 83, in which are two diaphragm-openings 84 arranged in a manner to receive a mouth-piece, or concentrator, 85, or listening-tubes, 86, to which suitable ear-attachments are connected. I prefer to construct said ear-phones with a nozzle 87, loosely fitting the ear, or resting upon, or over it. A supporting-plate 88 is attached, formed of metal, or other suitable material. This supporting plate fits over and is supported by the external ear.

The projecting ends of the plate carried by the post are provided with a tubular curtain of silk, textile fabric of any kind, or any other suitable material, fitting around the end of the tubular diaphragm-housing, when the plate is in position for use, and forming a soft non-vibratory connection between the parts, especially useful in reproducing, as it largely prevents and deadens the disagreeable scratching and other sounds set up by the movement of the material and by the moving parts of the apparatus. These sounds are conveyed to the ear by the molecular vibration of the solid portions of the mechanism, and are frequently confusing and sometimes practically extinguish the articulating vibrations.

In Fig. 14 I have shown a diaphragm-plate 88', having three diaphragm-openings 89, adapted to diaphragms 47^a of varying diameter and therefore of different susceptibility to respond to sound-vibrations. These diaphragms may be of the same, or of different material and held and damped in different ways, to adapt

them to respond to different voices and sounds of varying force, or phonetic intensity. I also provide a diaphragm 90, of special construction. I have found, in practice, that a diaphragm composed of a plurality of disks, or plates, such as thin mica, or mica combined with other suitable material, or all made of wood with the grain running in different directions is of great advantage, being less rigid than a single disk of the same thickness. It is less affected also, by temperature and is more effectively responsive to articulation. It produces, also, less false vibrations than diaphragms of other construction. I have shown this compound diaphragm formed of three disks held together by the central post 60', but they may have other means of connection, either central, or non-central.

I use any preferred form of stylus, but prefer a point of small, hardened steel-wire, placed in a tubular, split socket, 91, having a thread to receive a nut 92, by which the socket may be closed.

I prefer, in some instances, to use a plurality of points, or styles, upon the single point-carrying arm 63. This construction is shown in Fig. 5, in which the reference numeral 63, indicates the point-carrying arm, and the numerals 63^a, 63^b, a pair of styles, or points, mounted thereon in the usual manner, or in any preferred way. As I prefer to use the record-receiving material in duplicate, as already described, a plurality of points, or styles is necessary and they will be mounted on the single point-carrying-lever, as set forth and receive their vibrations from a single diaphragm.

What I claim is—

1. In a phonographic apparatus a support for the record-receiving material, a swinging-arm adjustable, relatively to said material, an independent, point-carrying arm, diaphragms secured to the swinging arm and a swinging piece carrying the concentrator upon one side and the ear-tubes and phones on the other side of the axis of movement of the swinging piece, substantially as described.

2. In an apparatus having a record-receiving, or record-containing material the combination with means for moving the same, of one or more suitably held styles or points, a diaphragm and an adjustable tension-regulator exerting a variable pressure upon the diaphragm within the line of its marginal attachment, and between the same and the recording or reproducing point, substantially as described.

3. In a phonographic apparatus a rotating support for the continuous record-receiving band, suitable supporting and guiding-rollers, a diaphragm and means, substantially as shown, for keeping the latter under tension, the tension-devices having surface-contact with the face of the diaphragm at a plurality of points between the center and the line of marginal attachment, substantially as described.

4. In a phonographic apparatus, a pivoted, point-carrying arm, or lever, a diaphragm, and a connecting-piece between the diaphragm and said point-carrying arm, a rigid connection being formed between the latter and said connecting piece, and constituting the sole support of said point-carrying-arm, substantially as described.

5. In a phonographic apparatus, a pivoted or vibrating, point-carrying lever, upward projecting studs thereon, a dampener, swinging diaphragm-carriers and diaphragms and a swinging arm supporting such parts, substantially as described.

6. In a phonographic apparatus a recording-diaphragm and a reproducing-diaphragm each of different tension and constructed to be swung, or moved into and out of position for use independently, substantially as described.

7. In a phonographic apparatus, separate recording and reproducing-diaphragms upon a support common to both and arranged to be moved into and out of use independently of each other, in combination with an independently supported arm or lever carrying the point or style, one or more, for recording or reproducing, and having loose contact with the diaphragms, substantially as described.

8. In a phonographic mechanism, the combination with a support for the record-receiving material, a diaphragm, a supporting arm for the diaphragm-housing, or frame, and an elastic dampener between the lower face of said diaphragm and said supporting-arm, and eccentric to the central point of attachment of the point, or style, substantially as described.

9. In a phonographic mechanism, the combination with a diaphragm-frame, or housing, of a diaphragm loosely placed in a seat in said housing and an elastic strip, or filament, having non-central contact with the diaphragm at a plurality of points pressing the diaphragm upward and retaining it in its place in said housing, substantially as described.

10. In a phonographic apparatus, the combination with a diaphragm-frame, or housing, of a diaphragm loosely placed therein, an elastic strip or filament having surface-contact with the said diaphragm at a plurality of points, and exerting an upward pressure upon the diaphragm to hold it in its seat, and means

for varying said pressure substantially as described.

11. In a phonographic apparatus a movable or vibratory point-carrying arm or lever provided with a V, or cone-shaped recess or seat, a diaphragm, an adjustable connecting-piece between the arm or lever and the diaphragm arranged to rest or bear in the V, or cone-shaped seat in the lever, and means for holding the same together with a yielding contact by spring-tension, substantially as shown.

12. In a phonographic apparatus the combination with two or more styles of two or more recording diaphragms having different tensions as and for the purpose set forth.

13. In a phonographic apparatus two or more recording-diaphragms, having different tension, rigidity, or elasticity, fixed upon a support common to all and arranged to be moved into and out of place interchangeably, substantially as and for the purpose set forth.

14. In a phonographic apparatus, the combination with a diaphragm of an adjustable arm supporting the housing, or casing, of said diaphragm, and a soft, non-vibratory connection between the diaphragm and said arm, substantially as described.

15. In a phonographic apparatus, the combination with a single vibratory arm, of a plurality of styles, or points, carried by said arm and a diaphragm adapted to vibrate said arm, substantially as described.

16. In a phonographic apparatus, the combination with a single diaphragm of a single vibratory arm having rigid connection with said diaphragm at or near one end and a plurality of styles, or points, carried by the said arm, and arranged to operate upon different ribbons, or strips, of record-receiving material, substantially as described.

17. In a phonographic apparatus, the combination with a diaphragm composed of a plurality of disks, or plates, of the same diameter and having a common point of support, of a point, or stylus, connecting all of said diaphragm plates, or disks, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES ADAMS RANDALL.

Witnesses:

THOMAS LAKE,
T. T. BARNES.



(No Model.)

3 Sheets—Sheet 1.

J. W. MACKINTOSH.
PHONOGRAPH.

No. 503,610.

Patented Aug. 22, 1893.

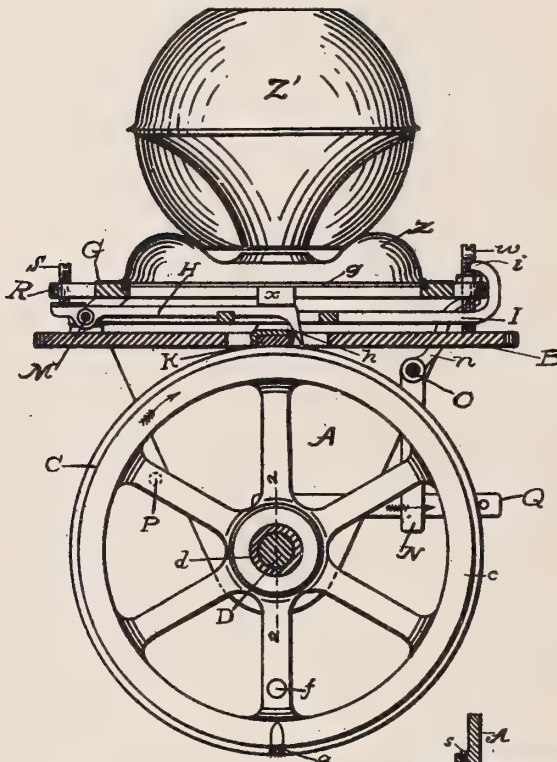


Fig. 1.

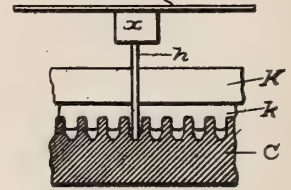


Fig. 3.

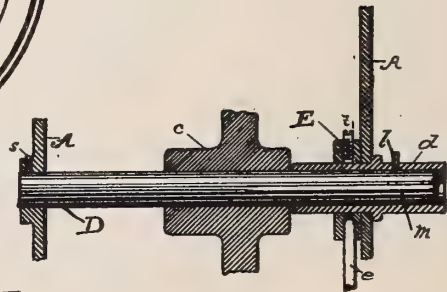


Fig. 4.

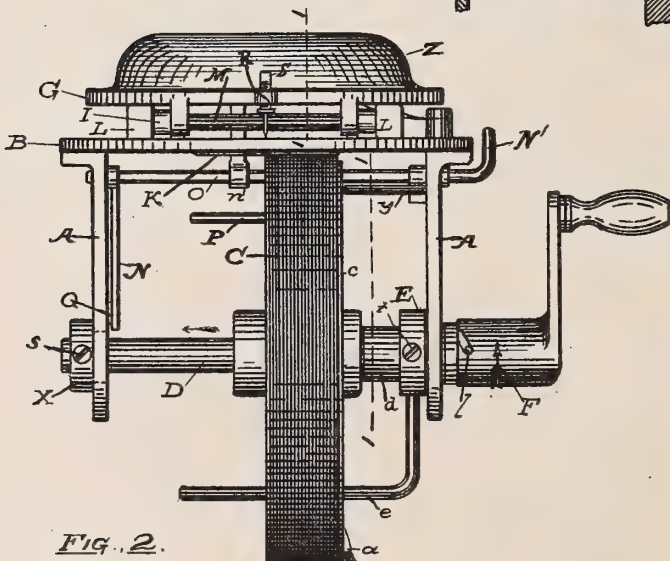


Fig. 2.

Witnesses.
a. J. Burrowe
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John W. Mackintosh.

(No Model.)

3 Sheets—Sheet 2.

J. W. MACKINTOSH.
PHONOGRAPH.

No. 503,610.

Patented Aug. 22, 1893.

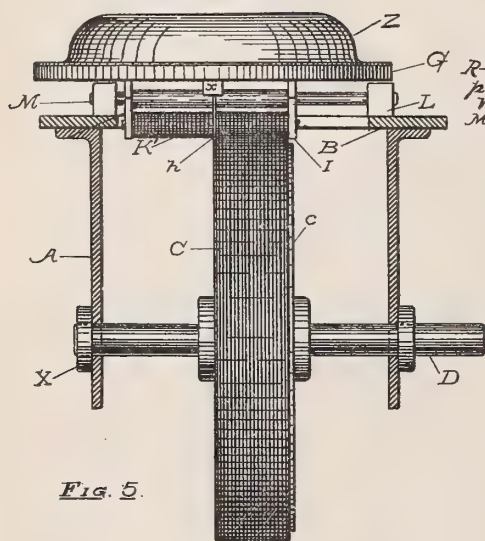


Fig. 5.

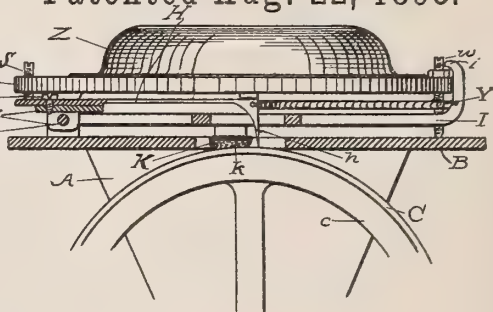


Fig. 6.

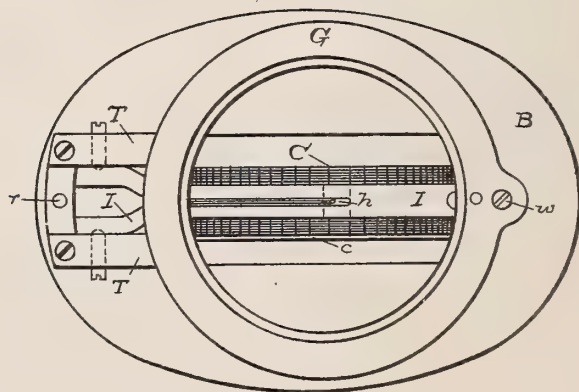


Fig. 8.

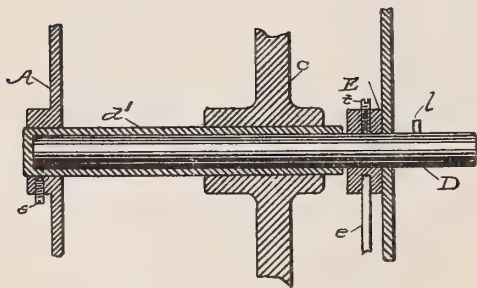


Fig. 9.

Witnesses.

Inventor.

A. J. Burrow
J. J. Cunningham

John W. Mackintosh.

(No Model.)

3 Sheets—Sheet 3.

J. W. MACKINTOSH.
PHONOGRAPH.

No. 503,610.

Patented Aug. 22, 1893.

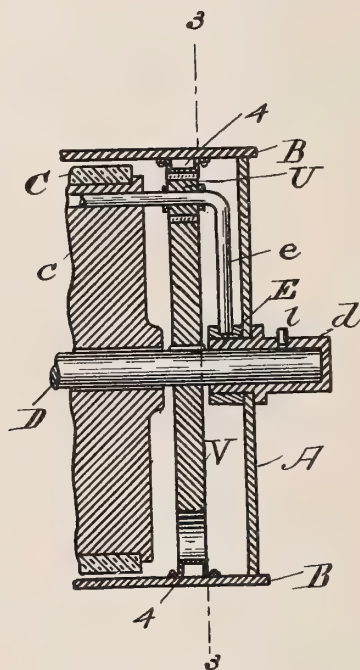


Fig. 7.

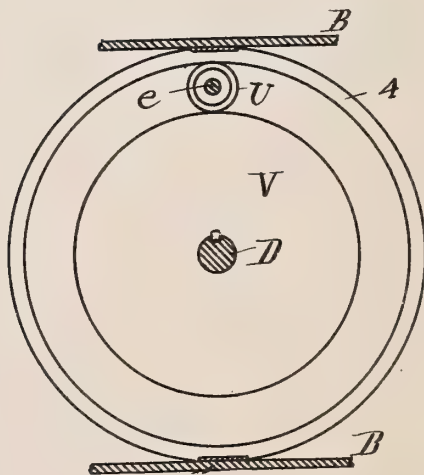


Fig. 7a.

WITNESSES

A. J. Burrows
J. J. Cunningham

INVENTOR.

John W. Mackintosh.

UNITED STATES PATENT OFFICE.

JOHN W. MACKINTOSH, OF BROOKLINE, MASSACHUSETTS.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 503,610, dated August 22, 1893.

Application filed September 6, 1892. Serial No. 445,202. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. MACKINTOSH, of Brookline, in the county of Norfolk and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Phonographs, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to the simplification of the instrument known as the phonograph for the purpose of making it commercially available not only as to cost, but also as to durability and ease of manipulation, particularly when used in dolls or other images to reproduce speech or other familiar sounds.

Heretofore in the construction of machines of this kind there has been difficulty in so accurately adjusting the reproducing stylus with relation to the line of indentations representing the sound-vibrations upon the record-plate, as to insure perfect coincidence between the point of the stylus and such line of indentations upon each successive return of the stylus to the beginning of the record; also, on account of the shallowness of the depression along the line of such indentations, there has been the constant liability to imperfect operation in the reproduction of sounds by reason of the stylus running upon the space between the lines of indentations on the record-plate or partially upon such space, or of jumping across such space from one part of the line to another, thus leaving a portion of the indentations untouched by the stylus and causing a discontinuous or broken reproduction of the recorded sound waves; and this difficulty was greatly increased by even slight abrasions of the surface of the record-plate, or by accidental dents or scratches therein. One of the chief reasons why the reproducing stylus could not be adjusted and controlled so as to drop upon the record of sound-vibrations in perfect alignment with its line of indentations at the beginning of each successive repetition was, because the operation of traversing the record-plate with the stylus was effected by devices which acted upon parts of the machine other than the record surface itself, and one feature of my invention consists in employing the ridges which define the spiral groove in the record-plate, in conjunction with a feeding device which engages with said ridges,

to cause the stylus to traverse the record formed in the bottom of said groove, and in order to make said ridges more enduring, I preferably, make the record plate or cylinder of a metal such, for instance, as an alloy of tin, or other material more enduring than wax, which has heretofore been largely used for record plates. I also prefer to cut said groove in a ring or disk which may be readily removed or replaced in the phonograph. By cutting such a groove in a metal or other enduring phonogram-blank and making the record in the bottom thereof several advantages are gained over prior constructions, namely: the record is better protected from injury by the ridges which define the continuous groove, the reproducing stylus is directed to the record and guided thereon with almost absolute certainty; the tops of the ridges are so narrow that the stylus will not rest thereon and at the same time the upper portion of the said ridges can be utilized as a means for causing the reproducing stylus to traverse the record.

I have found that when it is desired to slide a rotating cylinder longitudinally upon its axle or shaft, it is accomplished much more easily when the axle is still, or has a rotation in the same direction, but of different speed from that of the cylinder, than when the two are rotated at the same speed and in the same direction. Another feature of my invention is therefore to clamp the axle firmly to the frame of the machine, and turn the phonogram cylinder thereon by an interlocking arm of independent driving mechanism, which may be supported upon the same axle; or, to support and move the said cylinder upon a stationary sleeve, within which may turn one end of the shaft that carries the driving mechanism. The stationary axle is a benefit in the operation, however the cylinder is rotated thereon, or however it is caused to move longitudinally thereof, for it will be found advantageous even when the phonograph cylinder is caused to slide longitudinally of its axle by means of the feed-block applied to a screw thread cut upon the hub of the cylinder as in some of the prior constructions.

It will be readily understood that the diaphragm, the reproducing stylus and the feed-block may be caused to move from side to

side and thus traverse the stylus across the record, by lengthening the pintle on which they are all pivoted, and holding the deeply grooved cylinder rigidly upon the shaft by which it is rotated.

Another though minor improvement is the use of a small brush, preferably attached to the cylinder at the edge at which the record is finished to clean the stylus when it leaves the record and a rod to act as a scraper to clean said brush, as hereinafter described.

Referring to the drawings in which I have illustrated the embodiment of my improvements in specific form, Figure 1, is a vertical section of all parts of the apparatus excepting the cylinder, on lines 1—1 Fig. 2, and viewed from the right hand side of said Fig. 2. Fig. 2, is an elevation of the apparatus viewed from the left hand side of Fig. 1 with the globular resonating chamber removed. Fig. 3, is a greatly enlarged view of a portion of the grooved record-plate or ring, the feed-block and stylus, the record-plate being in section. Fig. 4, is a vertical section of the shaft and immediately surrounding parts on line 2—2 Fig. 1. Fig. 5, is an elevation of the cylinder and feed-block, the latter in the form of a small cylinder or roll, and the lengthened pintle on which the diaphragm-holder, &c., may slide. Fig. 6, is an elevation of a portion of the machine, with a portion of the frame, the feed-block arm and stylus arm, in section, showing the stylus arm pivoted on a vertical pivot to permit an independent movement in a horizontal plane. Fig. 7, is a sectional view of the cylinder and a simple construction for giving the shaft a motion different from that of the cylinder by means of friction disks. Fig. 7^a is a vertical section on line 3—3 Fig. 7, showing a side elevation of the friction disks to give the shaft a different motion from that of the cylinder. Fig. 8, is a plan view, of the diaphragm-holder, feed-block and stylus arm, pivoted upon a supplemental vertical pivot, permitting them all to swing in an arc in a horizontal plane over the record. Fig. 9, is a vertical section of the parts of the machine immediately surrounding the shaft, showing the stationary sleeve on which the cylinder may slide and be rotated, and within which the shaft may turn.

In designating the several parts of the machine the same letters or figures are used in each view.

A are the two side portions of the frame of the apparatus which support the shaft or axle for the cylinder and driving mechanism; B the top part of the frame upon which the diaphragm-holder, the arm of the reproducing stylus and of the feeding-device are pivoted; C the grooved record surface or phonogram.

c is the phonogram cylinder.

D is the shaft or axle upon which the cylinder is supported and rotated; E the driving disk, which interlocks with the cylinder *c* by

a hole *f* in one of its spokes and causes it to rotate upon its axle.

F is the crank or key by which the driving mechanism is turned.

As illustrated in Figs. 2 and 4 the driving disk E is secured to a sleeve *d*, by a set-screw *t*, which sleeve is turned by the engagement of the key F with a projecting pin *l*, (see Fig. 2.) In this construction the sleeve *d* turns upon the shaft D which is held in a fixed position by the screw *s*, and through the disk E and its arm *e* the cylinder *c*, is turned upon that shaft. In the construction shown in Fig. 9 the cylinder *c*, is supported upon a sleeve *d'* within which the shaft D turns, the disk E being secured directly to the shaft by the set screw *t*. In this arrangement the phonograph cylinder is rotated and slides upon the sleeve instead of upon the shaft.

In Figs. 7 and 7^a, U is a small disk which turns upon the arm *e*, and V is a large disk keyed to the shaft D. A ring 4, attached to the frame of the apparatus, surrounds the two disks, and is of such a size as to hold the disk U closely between its inner surface and the disk V; thus as the arm *e* is turned, in the operation of turning the cylinder *c*, the disk U will move with said arm, and will be rotated thereon by the frictional contact of said disk with the ring 4, and by the contact of the disk U, with the disk V, the latter will also be caused to rotate and with it the shaft D, in the same direction, in the construction shown, but at a different speed from that at which the cylinder *c* turns. The shaft may be given a different speed of rotation in the opposite direction, and serve the desired purpose. The disk U may be covered with india-rubber to increase the friction between it and the disk V and ring 4. Gears may be used in place of friction disks, but the latter are preferable as they are practically noiseless.

G is the diaphragm-holder or frame; *g*, the diaphragm.

H is the stylus arm, *h*, the reproducing stylus.

I, is the arm or lever which supports the feeding-device or feed-block K, provided with a raw-hide covering *k*.

L, are the lugs secured to the top B of the frame of the machine, and in which the ends of the pintle M, have bearings; the diaphragm-holder, the stylus-arm and feed-block lever, all being pivoted upon that pintle.

N is a lever pivoted to one of the side pieces A and by the operation of which the diaphragm-holder is raised. In order to have this raising lever act more uniformly upon the diaphragm-holder, its pivot O may be extended across the space between the two parts A and the upper portion *n* of the raising-lever secured to the said pivot at a position as nearly in line with the stylus-arm as the other parts of the apparatus will permit.

Upon the cylinder *c* is a projecting finger P (see Fig. 2) and when the cylinder is re-

volved, as indicated by the arrow, Fig. 1, and advanced longitudinally upon its axle, as indicated by arrow Fig. 2, in reproducing the recorded sound waves, this finger will strike the lower end of the lever N and move it, as indicated by arrow Fig. 1, thus causing the other end *n* to raise one side of diaphragm-holder, turning it upon the pintle M at the other side. The lever N, is prevented from being thrown too far outward by the friction of a spring Q. In a piece R which projects from the diaphragm-holder beyond the pintle M is a screw S, which will strike upon the projecting rear end of the stylus-arm when the diaphragm-holder is raised by the lever N as described. And by adjusting this screw S the relative height to which the stylus will be raised by the action of the diaphragm-holder can be determined. Also by extending the feed-block lever and turning its end over the edge of the diaphragm-holder in a hook *i* the feed-block may be raised from contact with the cylinder by the same upward movement of the diaphragm-holder, but this should occur after the stylus has been disengaged from the record. Thus it will be seen that by the movement of the lever N, in the direction indicated, the diaphragm, the stylus and the feeding-device may be successively raised or moved away from the cylinder and leave it free to slide longitudinally upon its shaft, and by the reverse movement of the lever N which may be effected by the projecting releasing finger N', the feed-block, the stylus and the diaphragm will be successively lowered, but in the reverse order. A small piece of india rubber *x* is attached to the center of the diaphragm and immediately over the stylus, to provide an elastic contact between them, and by means of a screw *w*, at the side of the diaphragm-holder, opposite the pintle on which it tilts, the pressure of the diaphragm upon the stylus may be regulated.

In Fig. 5, is illustrated a construction whereby the diaphragm, its holder, the feed-block and stylus are traversed across the surface of the record cylinder. The pintle M, is lengthened as shown at the right hand side; the feeding-device is in the form of a small cylinder or roll K'; and the cylinder *c*, being securely fastened upon its shaft D, will, when it is rotated to produce the recorded sound vibrations, cause the diaphragm, feed-block, stylus and their connected parts, to move to the right across the face of the cylinder.

As shown in Fig. 8, T is a supplemental frame which supports the diaphragm-holder, the feed-block and the stylus, and which is pivoted to the top portion B of the frame of the apparatus by a vertical pivot *r*, upon which the said supplemental frame T, with the several parts which it supports may be swung across the face of the record cylinder where it is rotated by the action of the interlocking ridges upon the feed-block and the said cylinder.

In Figs. 1 and 2, *a* is a small brush attached

to the edge of the cylinder *c*, near its periphery, in such a position that it will strike across the point of the stylus after it has completely traversed the record surface and passed off the edge of the cylinder. This brushing will clear from the point of the stylus any dust and dirt which it may have scraped from the grooves of the cylinder. And when the cylinder has been returned to its initial position this brush *a*, will be cleaned by striking across the projecting wire *y*, during the first revolutions of the cylinder.

In Fig. 6 is illustrated the construction whereby the stylus has an independent lateral swing, the stylus arm being held by a pivot *p*, in the supporting piece W, which turns upon the pintle M, in the same manner that the stylus-arm does in the constructions previously referred to. Y is a spiral spring with one end attached to the stylus arm opposite to the pivot *p*, and the other end to the hooked portion of the feed-block arm, and by this spring the stylus will be properly held while being cleaned by the brush *a* and also will be started into the record groove in a proper manner.

For the purpose of conveniently oiling the shaft D, it is slightly flattened or grooved for a short distance inward from the end at which the key is applied, as indicated at *m*, Fig. 4.

In Fig. 1, Z' is a resonating chamber and Z a supplemental chamber over the diaphragm.

The construction and arrangement of the shaft D and its supporting parts illustrated in Figs. 1, 2, and 4 will be found very simple and convenient for the purpose of removing and replacing the cylinder *c*, when it is desired to renew or change the record ring, for by loosening the screw *s*, the shaft may be pushed through the sleeve *d*, sufficiently far to allow the cylinder *c* to slip off the end and be turned down upon the horizontal portion of the arm *e*, from which it can be readily removed. When constructed with a sleeve *d'* as shown in Fig. 9, both the screws *s*, and *t*, should be loosened when the cylinder is to be removed.

The form of the ridges and grooves in the record-plate and the feed-block, and the manner in which they are interlocked, is clearly shown in the enlarged view Fig. 3, and will not need further explanation.

I claim—

1. In a phonograph, a stationary cylinder-shaft, a record-cylinder normally free to slide longitudinally thereof and to be rotated thereon, independent mechanism to rotate said cylinder, and external mechanism to engage therewith and cause it to move longitudinally on said shaft, substantially as described.

2. In a phonograph, a record-cylinder and driving-mechanism therefor, a stationary axle upon which both are supported and rotated, and a feeding-device which causes said cylinder to move longitudinally of said axle when rotated thereon substantially as described.

3. In a phonograph, a phonogram-cylinder,

a supporting-shaft, mechanism to move the cylinder longitudinally of its shaft and mechanism for giving the said cylinder and its shaft differential rotary motion for the purpose substantially as described.

4. In a phonograph, a cylinder-shaft, a cylinder which is normally free to slide and to rotate thereon and is provided with a spiral groove of substantial depth upon its periphery, and a record of sound-vibrations within said groove, a feeding-device which engages with the ridges between the cylinder-grooves to control its sliding movement upon the shaft, and driving-mechanism to rotate the cylinder thereon, substantially as described.

5. The combination in a phonograph, of a phonogram-cylinder which has a spiral groove in its periphery, a stationary axle therefor, driving-mechanism to turn the cylinder thereon, and a grooved feeding-device which engages with the grooved surface of the phonogram and gives the cylinder an advancing motion longitudinally upon its axle, substantially as described.

6. In a phonograph, a phonogram-cylinder, a supporting-shaft upon which it is normally free to slide longitudinally, a feeding-device independent of the stylus, and mechanism to cause it automatically to engage with the grooved periphery of the phonogram whenever the reproducing stylus is in contact with the record thereon, substantially as described.

7. In a phonograph, having a diaphragm for reproducing sound-waves, a cylinder which carries a phonogram provided with a spiral-groove with a record of sound-vibrations in the bottom thereof, a ribbed feeding-device held between the said diaphragm and cylinder and adapted to engage with or be disengaged from the ridges on the said cylinder, and a reproducing-stylus normally held in a position with relation to the ribbed feeding-device which will locate the point of the stylus and the apex of one rib of the said feeding-device in a single plane which is perpendicular to the diaphragm, substantially as described.

8. In a phonograph for reproducing sound-vibrations a diaphragm held in a hinged frame, a reproducing point attached to a pivoted lever and supported thereby between the phonogram and the diaphragm, but unattached to the latter; a ribbed feed-block which co-operates with ridges upon the phonogram and an automatically operated disengaging lever by which the diaphragm-frame is first raised and the reproducing point and feed-block are successively disengaged from the phonogram, when it is to be returned to its initial position, substantially as described.

9. In a phonograph, a record-plate provided with a continuous groove of substantial depth in its surface and a record of sound-vibrations in the bottom of said groove, a stylus which substantially fits the record portion of the groove and an independent feeding-de-

vice which engages with the tops of the ridges which define the groove and thereby causes a traversing motion between the stylus and record-plate when the phonograph is operated.

10. In a phonograph, a reproducing diaphragm, a phonogram containing a record of sound-vibrations in a groove thereon, and a stylus between said diaphragm and phonogram supported independently of each upon an arm held by a pivot upon which it is adapted to swing in the arc of a circle in a plane parallel to the surface of the diaphragm, substantially as described.

11. In a phonograph, the combination with a phonogram or record of sound-vibrations and a reproducing-stylus, of mechanism which causes the stylus to traverse the said record, and a stylus-cleaning brush which is automatically caused to strike across the point of the said stylus after each complete traversing of the record thereby, substantially as described.

12. In a phonograph, having a record of sound-vibrations and reproducing-stylus, mechanism which causes the stylus to traverse the said record, an automatically operating stylus-cleaning brush and a scraper therefor, substantially as described.

13. In a phonograph, provided with a record-plate containing a record of sound-vibrations in a groove thereon, a reproducing-stylus supported upon an arm held by a pivot upon which it is adapted to swing in the arc of a circle in a plane parallel to the surface of the diaphragm, a stylus-cleaning brush, and a spring to hold the stylus in position for the action of said brush, substantially as described.

14. In a phonograph, the phonogram-cylinder normally free to slide longitudinally of its shaft and provided with a spiral ridge which defines its record groove, and a ribbed feeding-device which has a cylindrically concave contact surface to engage with said spiral ridge and which is supported by pivots which are parallel to its own axis and that of the record cylinder, substantially as described.

15. The combination in a phonograph, of a cylinder provided with a spiral groove upon its record surface, a feeding device provided with a ribbed surface which is the counterpart of a section of the grooved surface of the cylinder and engages therewith, a stationary shaft on which the cylinder may turn and slide, a diaphragm-holder hinged to the phonograph-frame and adapted to be automatically raised by the movement of the said cylinder and thereby successively raise the reproducing stylus and the said feeding-device, substantially as described.

JOHN W. MACKINTOSH.

Witnesses:

A. J. BURROW,

T. J. CUNNINGHAM.

(No Model.)

J. H. WHITE.
PHONOGRAPH.

No. 504,380.

Patented Sept. 5, 1893.

Fig. 1.

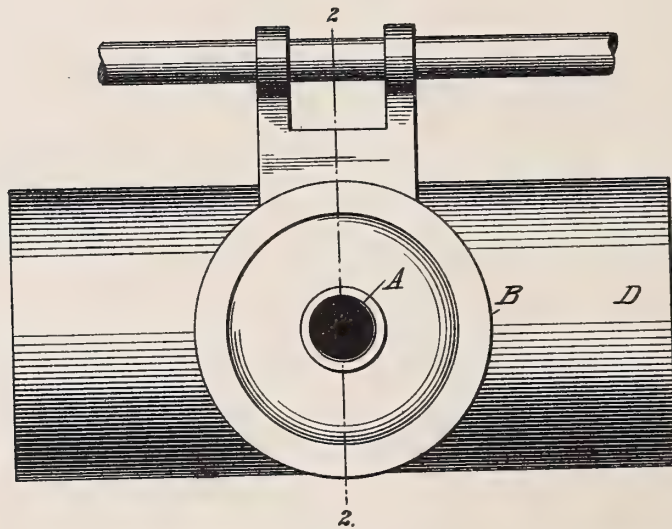
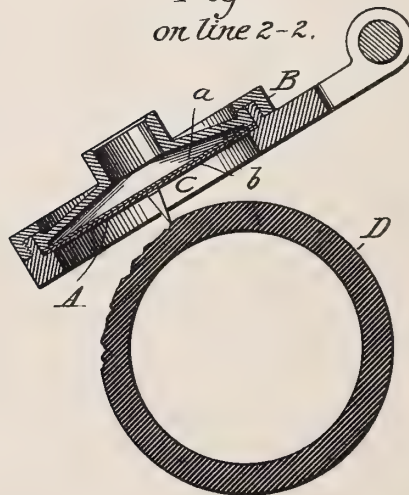


Fig. 2.
on line 2-2.



Witnesses
Raymond Barnes
J. S. Elmer.

Inventor
J. H. White
By Phil T. Lodge.
Attorney

UNITED STATES PATENT OFFICE.

JOHN H. WHITE, OF WASHINGTON, DISTRICT OF COLUMBIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 504,380, dated September 5, 1893.

Application filed November 23, 1891. Serial No. 412,811. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. WHITE, of Washington, in the District of Columbia, have invented a new and useful Improvement in

5 Phonographs, of which the following is a specification.

My invention has reference to that class of instruments for recording and reproducing sounds in which a vibratory, peripherally-sustained diaphragm is used in connection with a recording or reproducing style or both. Heretofore these diaphragms have ordinarily consisted of a single thickness of iron, aluminium, glass or similar material. Practical

10 experience has shown that each of these materials is attended in use by certain advantages and disadvantages. Now, the aim of my invention is to render the advantageous qualities available, and at the same time, to

15 avoid the objectionable or disadvantageous qualities, and to this end I employ a laminated diaphragm, that is to say, a diaphragm composed of two or more sheets or layers throughout its operative portion, the sheets being constructed preferably of different materials, and

20 preferably cemented together. In this way I am enabled to combine the strength of one material with the resonant qualities of another, and to prevent the diaphragm from losing its flat shape under changes of temperature, the one material so modifying or affecting the action of the other that the instrument will record or reproduce the sounds with

25 great accuracy.

My laminated diaphragm may be used in connection with the Edison phonograph or either of its forms, or with the Tainter graphophone, or with any equivalent form of instrument. The diaphragm may be mounted in

30 any suitable manner, and used in connection with recording or reproducing styles attached directly thereto or connected therewith through intermediate levers or other devices, such as commonly known in the art. I have, therefore, considered it sufficient to illustrate

35 in the drawings, the diaphragm, its supporting-frame, a style, and a record cylinder.

In the accompanying drawings,—Figure 1 is a top plan view of said parts. Fig. 2 is a

40 vertical cross-section on the line 2—2.

Referring to the drawings, A represents the diaphragm, and B, the encircling-frame by

which it is peripherally sustained; C, the style connected to the diaphragm and D, the record cylinder, the general organization and operation of the parts being the same as in existing machines.

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The diaphragm as represented consists throughout its diameter of two sheets, plates or layers *a* and *b*, laid flatwise one upon the other, and both confined and sustained at the periphery in the frame in the same manner that the ordinary diaphragms are supported. The sheets *a* and *b* may be constructed respectively of mica and glass, glass and aluminium, or of other materials differing in nature from each other, provided only that they are adapted to respond freely to and vibrate under the atmospheric impulses or the influence of the reproducing style, as the case may be. I find that the best results are attained when the laminæ are cemented tightly together throughout their opposing surfaces. The most satisfactory results are obtained when the diaphragm is composed of but two sheets or laminæ but it is to be understood that my invention contemplates the use of three, four or more sheets. When glass is combined with metal, both sheets being as thin as practice will permit, I am enabled to

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unite the strength of the metal with the resonant qualities of the glass, to keep the diaphragm in flat form and avoid that buckling and twisting which commonly result from changes of temperature when the diaphragm consists of a single metallic sheet. When combined as above described the two laminæ exert each a modifying influence on the action of the other.

I am aware that a diaphragm has been given an increased thickness at the center by cementing together a series of sheets successively diminishing in diameter, the outer or marginal portion of the diaphragm consisting, however, of a single sheet, and this construction is foreign to my invention.

Having thus described my invention, what I claim is—

1. In a phonograph, and in combination with a recording or reproducing style, a diaphragm composed of a plurality of sheets of substantially the same size laid one against the other.

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2. A phonograph diaphragm composed of a

sheet of metal and a sheet of glass in close contact with each other, and having their adjacent surfaces cemented together.

3. In a phonograph the combination with
5 the style and cylinder of a diaphragm composed of sheets of metal and glass in close contact with each other, and a supporting frame for the diaphragm.

4. A phonograph diaphragm composed of
10 alternate sheets of metal and glass in close contact with each other and secured together.

5. A phonograph diaphragm composed of a

sheet of glass and a sheet of non-vitreous material in close contact with each other.

6. A phonograph diaphragm composed of a
15 sheet of glass and a sheet of metal connected together.

In testimony whereof I hereunto set my hand, this 31st day of October, 1891, in the presence of two attesting witnesses.

JNO. H. WHITE.

Witnesses:

W. R. KENNEDY,

F. S. ELMORE.

(Model.)

J. E. WASSENICH.

TABLET FOR RECORDING SOUND VIBRATIONS.

No. 505,910.

Patented Oct. 3, 1893.

Fig. 1.

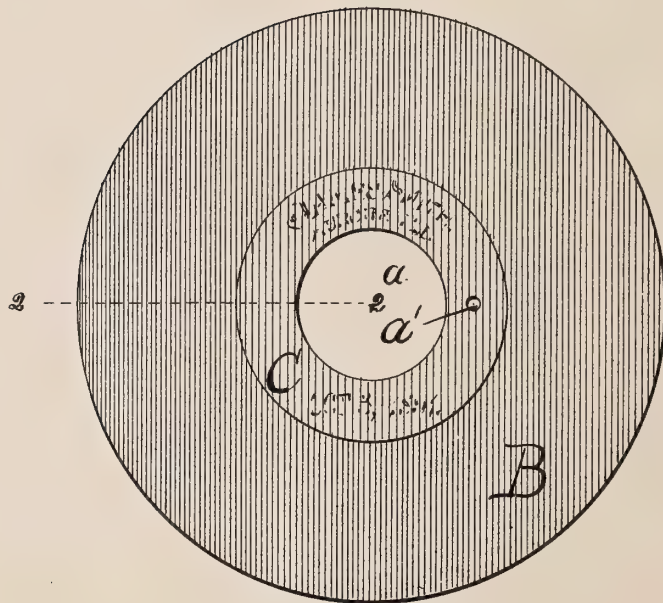
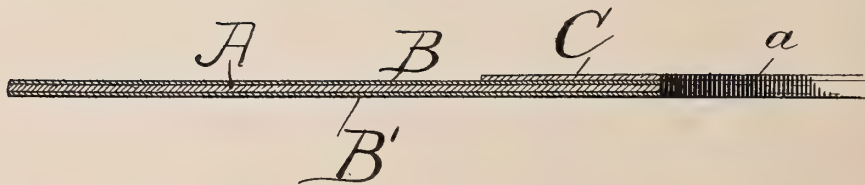


Fig. 2.



Witnesses:
Chas. E. Gaylord
Louise Miller.

Inventor:
Joseph E. Wassenich
By *Dayton, Poole & Brown*
his Attys.

UNITED STATES PATENT OFFICE.

JOSEPH E. WASSENICH, OF CHICAGO, ILLINOIS.

TABLET FOR RECORDING SOUND-VIBRATIONS.

SPECIFICATION forming part of Letters Patent No. 505,910, dated October 3, 1893.

Application filed June 29, 1891. Serial No. 397,860. (Model.)

To all whom it may concern:

Be it known that I, JOSEPH E. WASSENICH, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Tablets for Recording Sound-Vibrations; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to the construction of tablets or disks for use in machines known upon the market as graphophones, or instruments for recording and reproducing vocal or other sounds, the tablet being the medium upon which the sound record is cut by the recording style. Such tablets have heretofore been constructed generally of a base or foundation of a rigid material provided with a surface coating of wax or a waxy composition. The tablets are sometimes cylindrical and sometimes flat. The base or foundation material has been composed of various materials, pasteboard, cardboard, leather, leatheroid, vulcanite and various other materials, but it is found that all these materials are liable to warp upon cooling of the wax or waxy composition when the latter is applied to the foundation or base, such application usually being made when the wax or waxy composition is hot. If, on the other hand, the base material is held rigid until the coating has been applied warping may occur at any subsequent time by reason simply of atmospheric changes to which the tablet may be subjected. In an attempt to overcome these difficulties and to prevent the formation of air bubbles in the wax by air held therein when cardboard or other porous material was used as a foundation, a metal base with a turned-up edge was proposed. When the hot waxy coating is applied to a thin metal base, the latter sometimes contracts unevenly and undulations are formed therein, thus preventing the tablet from being flat on the machine when receiving a sound record, and also affording the waxy coating a greater tendency to crack. Added to this objection was the additional weight of the metal over the cardboard or paper formerly used. When heavy cardboard, metal or a

substantially rigid base has been employed, it is found that the slightest bending of the disk caused accidentally when the latter is transmitted through the mail, or otherwise, will crack the waxy surface and destroy the impression thereon, while on the other hand a coating upon one side of a cardboard or similar base would cause the latter to curl up. For these and other reasons a disk tablet has been heretofore found to be of no commercial or practical value and hence all sound recording and reproducing instruments are provided with cylinders or tubes having a waxy coating on their periphery. To remedy these difficulties and to produce a disk or tablet that shall be at the same time so flexible as to withstand the ordinary handling, and even bending, without cracking the surface or coating thereof and which even if it should be slightly bended, will, owing to its flexibility, be readily forced against the table at the point where the sound recording or receiving style is working and thus the tablet will be for all practical purposes substantially flat when in the machine; and also to produce a tablet that will be compact and durable as well as light in weight and capable of commercial application, are some of the objects of the present invention and the same consists in the matters hereinafter pointed out and set forth in the appended claims.

In the drawings, Figure 1 is a plan view of a disk illustrating my invention, and Fig. 2 is an enlarged vertical sectional view of a portion thereof, taken upon line 2—2 of Fig. 1.

In the drawings let A represent the base, preferably circular and provided with an opening or hole *a*.

a' is a hole or opening by which the disk may be suitably secured in position upon the machine by means of a suitable pin inserted therethrough.

B represents the upper and B' the lower coating upon the base A, and C represents a thin ring or disk of paper or the like, upon which latter the name of the person writing or receiving the letter or message placed upon the disk together with the date of the message may or may not be printed, written or stamped, at the convenience of the user.

In carrying out my invention, I use a thin

flexible body such as paper or the like, ranging in thickness from about two one-thousandths to about five one-thousandths of an inch. To one or both surfaces of this base I apply a thin coating of ozokerite wax, say approximately about from two one-thousandths to about four one-thousandths of an inch in thickness. These figures are approximate only, the essential feature being a flexible wax on a flexible base to produce a flexible tablet. This coating may be very easily applied by machine or by hand by any of the well known processes for coating objects with wax. Cheapness is essential in order that tablets can compare favorably as a substitute for writing paper. Lightness in weight is required in order that a number of these tablets may be passed through the mails for the amount of the usual letter postage. Flexibility is required in order that the tablet may give and bend instead of cracking during ordinary handling and during its transmission through the mails. Compactness is desirable in order that in filing the tablets away a quantity of them may occupy the same or less space than an ordinary letter. In making the tablets as above described, about one hundred of them may be placed in a box one inch deep. Durability is required and very desirable in order that the tablets may stand a considerable amount of rough handling both in placing them upon and taking them off of the machine and otherwise handling the same.

A tablet made with a very thin base, as above described, and with an exceedingly thin coating on one or both sides, as above stated, will possess all of the desirable qualifications herein enumerated and avoid the objections heretofore pointed out as existing in the disks or tablets heretofore attempted.

As a separate and further improvement, I point out the utility of the disk C of paper or other material applied to the central portion of one or both sides of the tablet and upon which information may be printed or written whereby the particular disk and the message thereon may be recognized without placing the disk upon the graphophone or machine for that purpose.

As a further and separate improvement I make use of colored wax for the different disks whereby this identification may be the more complete. By the use of different colors in the different disks one writing machine

may be used for several lines of business in the same office or for several persons in the same line of business without having the disks mixed or confused.

I do not desire to confine myself to the use of paper as a base nor to the use of an ozokerite wax as a coating inasmuch as any suitable base and any suitable coating which when united will produce an exceedingly flexible tablet will embody the essential feature of my invention.

Where I place a sound recording surface of wax or the like to one side only of the base or body of the disk, I find it convenient to paint or cover the other side of the disk with a very thin coating of varnish or other similar material having the same coefficient of expansion as the sound recording surface coating, this to prevent warping and cracking.

What I claim is—

1. A flexible disk for recording sound vibrations adapted for use on a flat tablet holder, composed of a disk of paper or other suitable flexible material, with a coating of a suitable flexible sound recording material thereon, substantially as described.

2. A flexible disk for recording sound vibrations, consisting of a thin flexible body of paper or other suitable flexible material, having on both sides a thin flexible coating surface of a suitable sound-recording material substantially as described.

3. A flexible disk for recording sound vibrations consisting of a thin flexible body of paper or other suitable flexible material having on both sides a thin coating of wax or a wax-like sound-recording material, substantially as specified.

4. A phonogram disk of such an attenuated thinness as to lie loosely on a flat tablet holder and adapt itself firmly against the face of same at point where record is being made, substantially as described.

5. A flexible phonogram disk for use on a flat tablet holder and adapted to receive a sound record in the form of a spiral groove, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

JOSEPH E. WASSENICH.

Witnesses:

TAYLOR E. BROWN,
GEORGE W. HIGGINS, Jr.

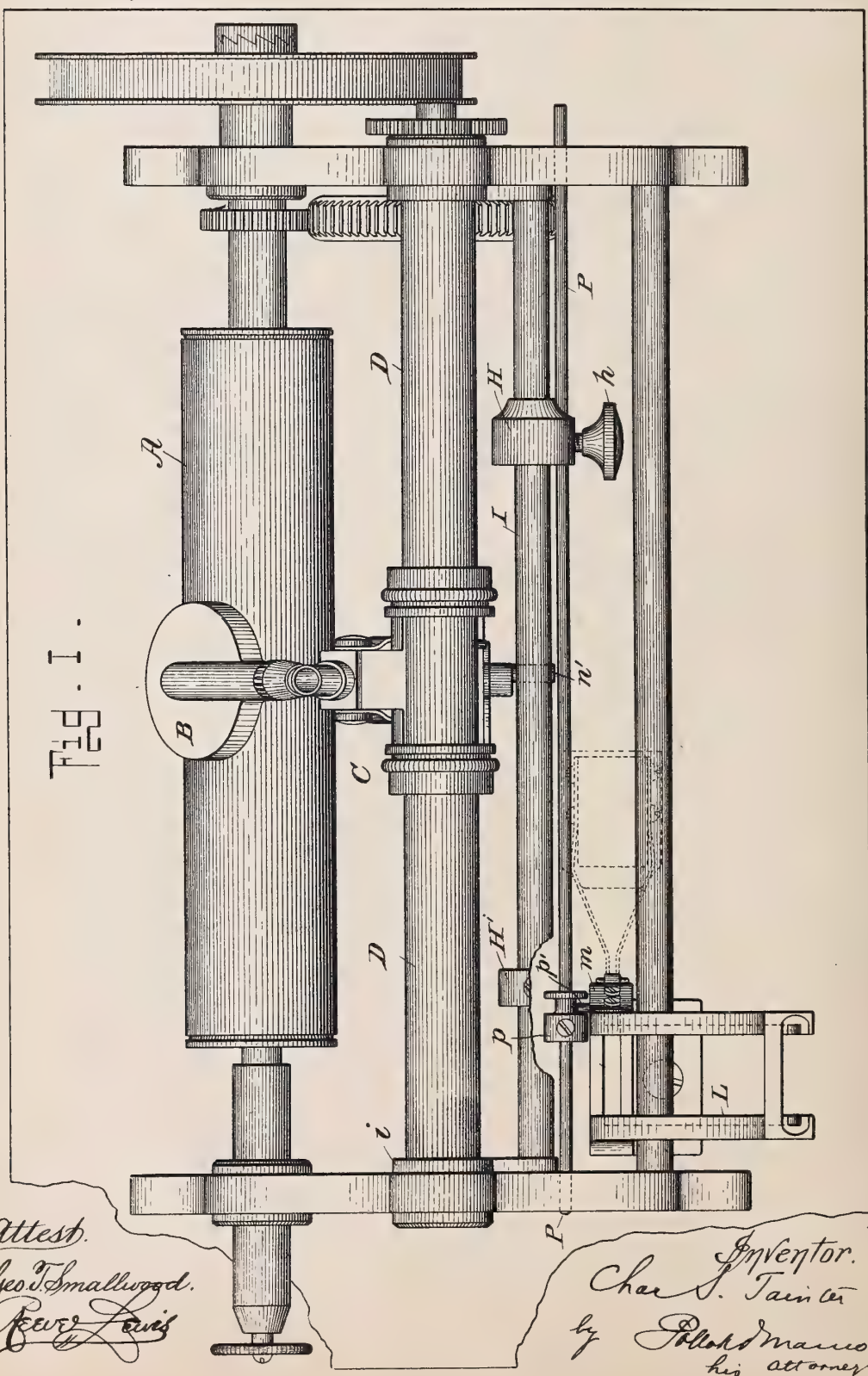
(No Model.)

3 Sheets—Sheet 1.

C. S. TAINTER.
COIN CONTROLLED GRAPHOPHONE.

No. 506,348.

Patented Oct. 10, 1893.



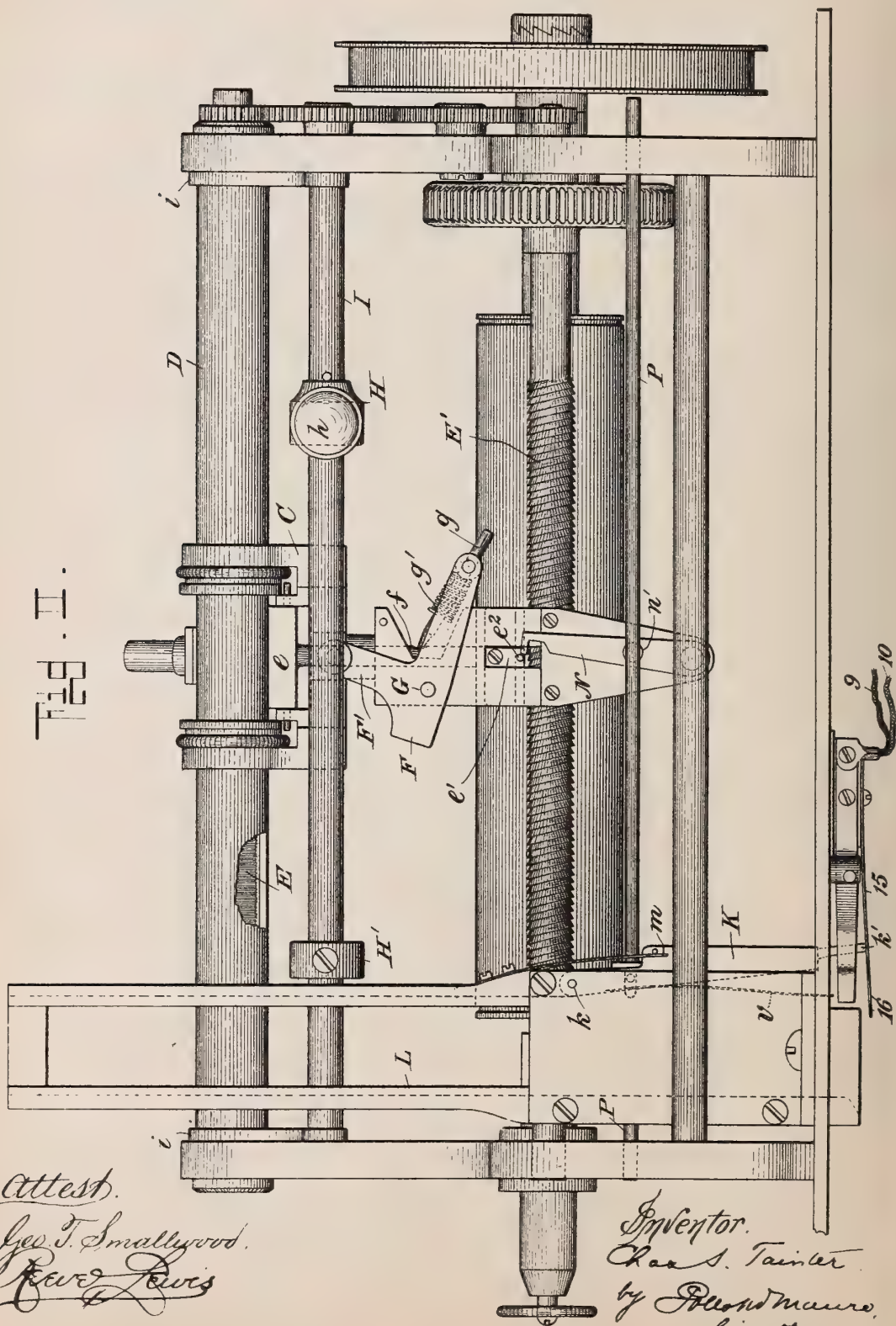
(No Model.)

3 Sheets—Sheet 2.

C. S. TAINTER.
COIN CONTROLLED GRAPHOPHONE.

No. 506,348.

Patented Oct. 10, 1893.



(No Model.)

3 Sheets—Sheet 3.

C. S. TAITER.
COIN CONTROLLED GRAPHOPHONE.

No. 506,348.

Patented Oct. 10, 1893.

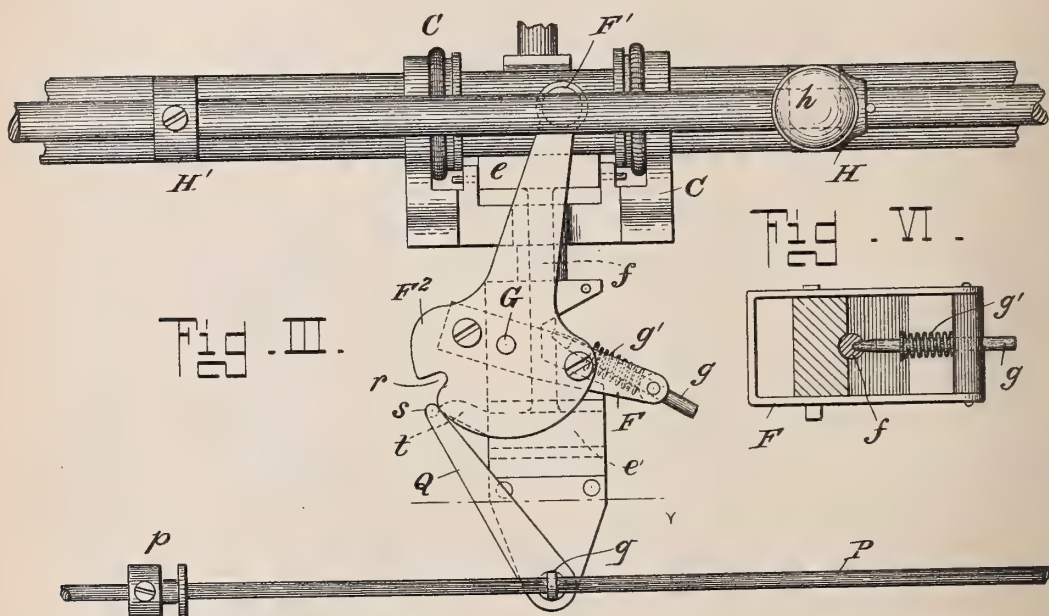


Fig. IV.

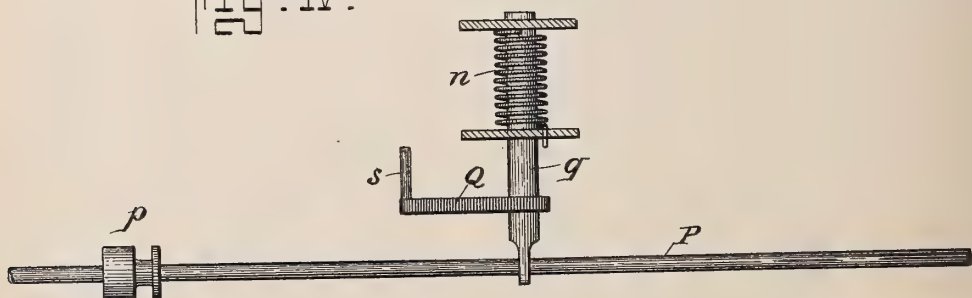
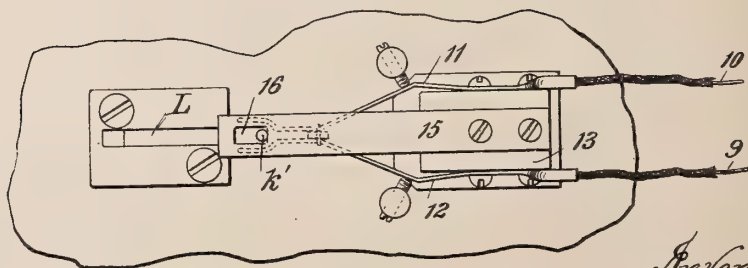


Fig. V.



Attest.
Geo. T. Smallwood.
Per Lewis

Inventor.
Chas. S. Tainter
by John Mauro,
his attorney.

UNITED STATES PATENT OFFICE.

CHARLES S. TAINTER, OF WASHINGTON, DISTRICT OF COLUMBIA.

COIN-CONTROLLED GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 506,348, dated October 10, 1893.

Application filed April 27, 1893. Serial No. 472,110. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SUMNER TAINTER, of Washington, in the District of Columbia, have invented a new and useful
5 Improvement in Coin-Controlled Graphophones, which improvement is fully set forth in the following specification.

The present invention has reference to the construction of actuating mechanism, controlled by the deposit of a coin, for instruments whereby sounds are recorded and reproduced, such instruments being known generally as phonographs or graphophones. An automatic actuating mechanism in common
15 use employs a feed screw of slow pitch for feeding the reproducer carriage in one direction, a return feed screw of rapid pitch, a tilting stirrup which is shifted by stops at each end of the path of the carriage, and a spring-actuated pin carried by said stirrup and adapted in one position to engage the carriage with the direct feed screw and in the other with the return feed-screw. By the operation of this mechanism the carriage when
25 started travels upon the direct feed screw until the stirrup is shifted by the stop at the last end of the direct screw, whereby it is disengaged from that screw and engaged with the return screw, and thereupon the reproducer carriage is returned to the starting point, upon reaching which the reverse shift occurs engaging it with the direct feed screw. At this precise moment it is necessary to arrest the machine, so that all the parts will be
35 in readiness for a new feed when another coin is deposited in the coin chute. The arrest of the machine is effected by breaking the circuit of the electric-motor by which the machine is driven. Difficulty has been experienced in securing the requisite precision in the operation of the reversing mechanism. Sometimes the shift would occur too soon and the motor circuit not being broken, the carriage would start off again, and perhaps continue in motion back and forth until the battery became exhausted.

The principal object of the present invention is to insure precision of action on the part of the reversing and stopping mechanism, so that the shift will be made with certainty, the coin latch be reset for the operation of a coin, and the motor circuit broken.

The invention consists in certain improvements and arrangements of mechanism whereby these and other advantageous results are
55 secured. The automatic feed mechanism is, or may be, the same in principle as that heretofore used, though this has been somewhat modified and improved. The starting and stopping of the apparatus is effected by a lever which is moved in one direction (to start the apparatus) by a spring, and in the other direction by contact of the reproducer carriage at the end of its return movement. Means are provided to insure the restoration
65 of this lever to its normal position before the carriage is disengaged from the return screw and engaged with the direct feed-screw. The starting and stopping lever, when pressed back against its spring is caught and held by
70 the coin-latch, so that the deposit of a suitable coin acts to start the apparatus by releasing the lever.

Apparatus of this character are most conveniently driven by electric-motors, but, of course the disconnecting mechanism could readily be applied to disengage a clutch or to effect analogous operations whereby the motion of machines is arrested.

The invention will be explained in connection with the accompanying drawings, in which—

Figure I is a plan view of mechanism constructed in accordance with the invention and applied to a graphophone. Fig. II is an elevation thereof. Fig. III is an elevation and Fig. IV a plan view in detail of another form of mechanism. Fig. V is a bottom plan view of the circuit making and breaking devices, and Fig. VI is a detail of the shifting
90 stirrup and accessories.

The tablet A and its actuating mechanism, the reproducer B, its carriage C, the hollow guide-rod D inclosing the direct feed screw E, as well as other parts which need not be
95 specified, are such as commonly used in the commercial graphophone and require no description.

The mechanism for reversing the movement of the reproducer-carriage or slide, except as hereinafter pointed out and claimed, is not of my invention. Its principal parts are the slow, or direct feed screw E, the rapid pitch return screw E', the nuts e e' carried on

opposite ends of the vertical rod *f*, the shifting pin *g*, whose point engages in a hole in rod *f* and is pressed toward the latter by a spring *g'*, and the tilting stirrup *F* in which the shifter-pin is carried. Rod *f* is capable of sliding vertically. In its highest position the carriage is engaged by nut *e* with the direct feed screw. In its lowest position it is engaged by nut *e'* with the return feed-screw. The tilting stirrup *F* which is pivoted at *G* controls the connections of the feed-nuts and screws. When in the position shown in Fig. I the shifter-pin *g* is pressing the rod *f* upward, and the carriage is moving to the right. When arm *F'* of the stirrup encounters stop *H* it gradually tilts, raising pin *g* until the latter has passed the horizontal position, when its spring *g'* acts, completing the movement of the stirrup, and snapping rod *f* downward, thus disengaging the carriage from the direct feed-screw and engaging it with the return screw.

Instead of making the stops in the form of adjustable arms as heretofore, a rod *I* is extended from end to end of the machine, being supported in brackets *i*, and upon this rod are sliding collars *H H'* provided with set screws. Set screw *h* of collar *H* has a milled head for turning by hand, and this collar can be set at any point lengthwise of the machine according to the length of the record to be reproduced. Stop *H'* after its initial adjustment will not ordinarily be disturbed.

The starting or stopping of the motor is effected by means of a lever *K*, pivoted at *k* in the side of the coin chute *L*, and whose lower end *k'* acts as a circuit-closer for the motor circuit. The conductors 9 and 10 represent this circuit, they being attached respectively to the terminal springs 11 and 12, which are mounted upon opposite edges of an insulating block 13 (Fig. V). These springs approach each other closely at their free ends, but are not electrically connected. To the under side of block 13 is attached a flat spring-latch 15, whose free end projects slightly under the mouth of the coin-chute *L*, so that the action of a coin falling through the latter will depress the spring momentarily. Near its free end, the spring or latch 15 has a slot 16, and as shown in Fig. V the end *k'* of the circuit closing lever *K* is normally held by this slot out of contact with terminal springs 11, 12. As soon, however, as spring 15 is depressed, lever *K* is released, and its spring *m* (Figs. I and II) swings it to the right, forcing circuit-closer *k'* between the springs 11 and 12 and bridging the space between them. This is the position of the parts as shown in Fig. II, the circuit being closed, and the reproducer carriage being in its forward motion. As soon as the rod *f* is snapped down by the reversal of the stirrup *F* and shifter-pin *g*, and nut *e'* engages the return feed screw *E'*, a pin *e²* carried by said nut is caught and held by the notched

arm *N*, which is pivoted in the lower part of the movable frame and actuated by a coiled spring *n* (Fig. IV) so that during the return movement of the carriage the latter is held positively to its feed screw, and even after the stirrup *F* is reversed, the carriage will continue to be moved by the return screw until the locking arm *N* is withdrawn. The breaking of the circuit, and consequent arrest of the slide or carriage, is effected by the action of the carriage through a rod *P*, supported loosely in bearings in the frame, so as to be capable of sufficient longitudinal motion to restore lever *K* to its normal position. Connection between the actuating rod and the lever may be made in any convenient way. As shown the rod *P* is provided with a grooved collar *p*, and a pin *p'* on lever *K* enters this groove. Collar *p* is in the path of a pin *n'* on arm *N*. When this pin encounters collar *p*, the rod *P* and the lever *K* move with the carriage until the end *k'* is restored to its normal position, and caught by latch 15. The coiled spring *n* which holds arm *N* in place is sufficiently strong to overcome the force of spring *m*, and prevent the unlocking of arm *N* until the circuit is broken and latch 15 reset for another operation. The stop *H'* is so placed that it will tilt the stirrup *F* and its shifter-pin *g* before the breaking of the circuit occurs, so that pin *g* is in position to throw rod *f* upward the moment arm *N* releases the latter. This release is effected, after lever *K* is reset. When this lever becomes rigid, arm *N* is, by further motion of the carriage, pushed back by contact of its pin *n'* with collar *p*; and thus after the breaking of the circuit is effected, the coin latch reset, and the stirrup *F* shifted, the nut *e'* is released from the return feed-screw *E'* and rod *f* resumes its normal position engaging the carriage with the direct feed-screw.

It will be observed that the moment lever *K* is pushed back, the current to the motor is cut off. The machine, however, does not at once come to rest, as the momentum is more than sufficient to move the carriage the distance required to release arm *N*.

In Figs. III and IV a somewhat different arrangement of the parts is shown, the operation, however, being similar in that the action of the rod *P* upon the circuit-breaker is insured, before the carriage disengages itself from the return feed-screw. In this case the stirrup-frame has at its under side a curved plate *F²* which acts as a cam upon the arm *Q* (which corresponds in some respects with arm *N* of the other figures) keeping it (against the pressure of a coiled spring *n* on its axis *q*) in the position shown in Fig. III. The axis or spindle *q* is perforated at its outer end and rod *P* passes through this perforation, which makes a loose fit so that, under normal conditions there is no connection between the rod and spindle. Cam plate *F²* has at one side a notch *r*, so that when in the shifting of the stirrup-frame, this notch comes oppo-

site pin *s* of the arm *Q* the latter is no longer held extended by cam plate *F*². The consequence is that the spindle *g* is turned slightly, and by its twist takes a bite or grip upon the actuating rod *P* of the circuit-breaker or stop-lever. For the purpose in view it is necessary that this connection should occur just as the carriage *C* is reaching the end of its return movement. It is also necessary to prevent its occurrence when notch *r* passes pin *s* at the end of the forward movement of the carriage. As shown, in Fig. III nut *e'* carries an arm *t*, which, when the nut is raised (that is during the forward movement of the carriage) is in the path of pin *s*, and prevents motion of arm *Q* when the stirrup shifts at the end of the forward movement. When, however, nut *e'* is lowered into engagement with the return feed screw, stop *t* is beneath pin *s* and opposes no obstacle to its movement. Consequently, when the stirrup is tilted by stop *H'*, pin *s* drops into notch *r* above stop *t*, and in consequence, spindle *g* grips and carries with it the actuating rod *P* of the circuit-breaker. This is timed to occur when the shifter-pin *g* has assumed a position nearly horizontal, nut *e'* being still in engagement with the return screw. Further movement of the stirrup, while actuating the circuit-breaker, brings pin *g* into a downwardly inclined position when it completes the shift by a quick action. By this complete movement of the stirrup-frame arm *Q* is pushed back by cam plate *F*², withdrawing pin *s* from above stop *t*, and thus permitting nut *e'* to rise.

As shown in Fig. I the coin-chute *L* is made with open faces and curved, as common, to permit coins or objects of small size that may be introduced to fall out. As a further precaution against fraudulent operation of the apparatus, I have placed on the edge of the lever *K* (which forms one side of the coin-chute) a delicate spring *v* (Fig. I). If a coin under the size by which the machine is designed to be operated, falls through the chute, this spring will keep it against the opposite side, and it will fail to strike the coin latch 15.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a reproducer slide or carriage, the direct and return feed screws, and means for shifting said carriage from one screw to the other at the respective ends of its travel, of starting and stopping mechanism comprising a spring-actuated lever, a coin-controlled latch or spring normally holding said lever retracted, and an actuating rod for resetting said lever, operated by the move-

ment of said carriage before its disengagement from the return feed-screw, substantially as described.

2. The combination with the reproducer-carriage, and the direct and return feed-screws, of an electric-circuit for the motor driving said screws, said circuit having normally open contact-springs or terminals, a circuit-closing lever, means for actuating said lever to close said circuit upon the deposit of a suitable coin, means for shifting the carriage from the return to the direct feed-screw, and connections between the carriage and lever, whereby the circuit is broken and the lever reset when the carriage returns to its normal position and before it is released from the return feed-screw, substantially as described.

3. The combination of the reproducer-carriage, the direct and return feed-screws, the nuts carried by a sliding rod for connecting the carriage alternately with the direct and return screws, a spring for actuating said rod, the tilting stirrup for changing the inclination of said spring, means for tilting said stirrup, stop mechanism including a lever actuated by contact with said carriage at the end of its return movement, and means for holding the nut in engagement with the return feed-screw until said stop mechanism has been actuated, and then releasing said nut, substantially as described.

4. The combination of the direct and return feed screws, the reproducer carriage, shifting mechanism carried thereby for connecting said carriage alternately to the direct and return feed screws, a locking arm holding the carriage positively in engagement with the return screw, a stop-lever actuated by the carriage when traveling on the return screw, and means for releasing said locking arm after the stop-lever has been actuated, substantially as described.

5. The combination of the coin-chute, the coin-latch projecting slightly into the path of a coin descending through said chute, a reproducer-carriage, feed-mechanism therefor set into operation by the depression of said latch, and a light spring in said coin-chute above the end of said latch, adapted to deflect a coin of less width than the coin chute away from said latch substantially as and for the purpose set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CHARLES S. TAINTER.

Witnesses:

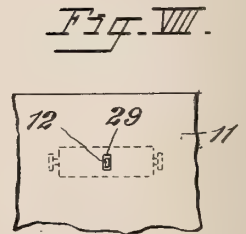
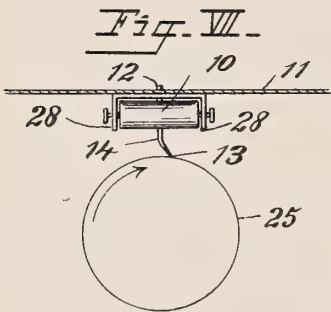
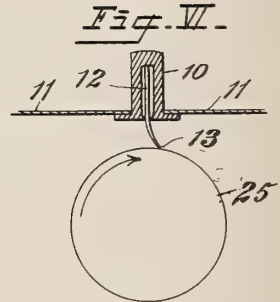
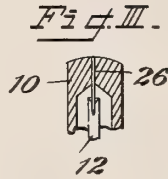
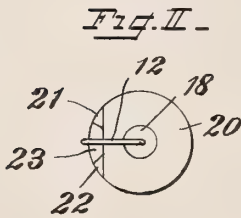
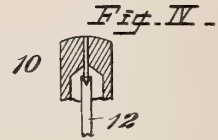
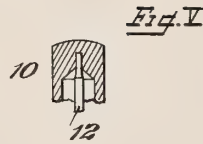
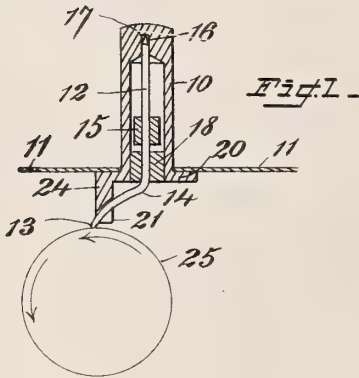
PERCIVAL L. WATERS,
PHILIP MAURO.

(No Model.)

C. S. TAITER.
REPRODUCER FOR GRAPHOPHONES.

No. 510,656.

Patented Dec. 12, 1893.



Attest
Arthur A. Erb.
Reverend Lewis

Inventor:
Charles S. Tainter,
by Edward Mauro,
his attorney.

UNITED STATES PATENT OFFICE.

CHARLES S. TAINTER, OF WASHINGTON, DISTRICT OF COLUMBIA.

REPRODUCER FOR GRAPHOPHONES.

SPECIFICATION forming part of Letters Patent No. 510,656, dated December 12, 1893.

Application filed July 7, 1893. Serial No. 479,802. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SUMNER TAINTER, of Washington, in the District of Columbia, have invented a new and useful Improvement in Reproducers for Graphophones, which improvement is fully set forth in the following specification.

This invention has reference to the construction of the reproducer in apparatus for recording and reproducing sonorous vibrations, and more directly to the form of the point of stylus and its connection with the diaphragm. In the reproducing devices which have yielded the best results heretofore, the point or stylus has been so mounted as to be capable of a limited lateral movement, independent of the diaphragm, so that it can adjust itself to the groove of the tablet and keep always in contact with the undulatory surface at the bottom of the groove, constituting the sound record. In one of the best forms which has been widely used, the stylus was made of a flat strip of steel having the general outline of a hammer, pivoted at one end to the casing of the reproducer, and having its other end flexibly connected with the diaphragm by means of a link. Long experience has shown that this form of instrument is susceptible of improvement, and that its principal defects are the following:

First. The flexible portion has not sufficient delicacy to insure that the point of the stylus will always impinge against the bottom of the groove. It will at times drag against one side thereof.

Second. The presence of a link or similar loose connection between the point and the diaphragm permits of lost motion, in consequence of which the sharp and closely crowded undulations made by sounds of high pitch are but imperfectly transmitted to the diaphragm.

Third. The several joints in the stylus and its connections allow it too much movement independent of the diaphragm, and cause rattling or scraping noises which interfere with the clearness of reproduction.

Fourth. The construction requires great care and fine workmanship, and is liable to derangement.

The object of the present invention is to remove or overcome the defects above pointed out, and it consists mainly in mounting the reproducing stylus directly upon the dia-

phragm itself, and pivoting or swiveling it in such manner that it can oscillate transversely of the sound groove without appreciable friction.

The principle of the invention may be carried out in various ways. In its simplest and best form the stylus is made of a piece of steel wire of the thickness of a sewing machine needle of medium size (about 0.025 of an inch in diameter) bent near the free end and rounded to a hemispherical point. This stylus is mounted in a support or socket carried by the diaphragm, in such manner as to oscillate with the utmost freedom. The stylus when so mounted acts by direct thrust upon the tablet and its lateral movement does not depend upon the flexibility of the material of which it is composed, but upon its swiveled connection with the diaphragm, the axis of oscillation being the line of the shank or stem of the stylus.

The invention and its advantages will be more fully understood from the accompanying drawings in which—

Figure I represents in vertical section a stylus and mounting constructed in accordance with the invention. Fig. II is a plan view of the same. Figs. III, IV and V are details illustrating different modes of supporting the inner end of the stylus. Fig. VI is a vertical section of another form of mounting. Fig. VII is a side view, and Fig. VIII a top view of still another embodiment of the invention.

All the drawings show the parts greatly enlarged beyond their natural size.

Referring first to Figs. I and II which show what is deemed the best and most practical construction, a tubular socket 10 of brass or other suitable material is attached to the center of the diaphragm 11, extending at right angles thereto. This socket may be about 0.3 of an inch in length, with an outside diameter of 0.1 of an inch and an interior diameter of 0.075 of an inch; but of course these dimensions are variable. The socket or support for the stylus may be connected with the diaphragm in any convenient manner. As shown the tubular or cup-portion passes through a perforation in the diaphragm, the flange 20 resting against the under side thereof.

The stylus 12 is made from a straight cylindrical piece of steel, one end of which is rounded and polished to form the rubbing

contact point, 13, after which a bend 14 is formed about a quarter of an inch from the rubbing-point, so as to throw the latter out of line with the main portion of the stylus.

5 A collar 15 is secured to the stem of the stylus which is inserted into the socket with its sharp conical pointed end 16 bearing against the bottom of a hole 17 drilled in the end of the socket. In the mouth of the latter is fitted a bushing 18 centrally perforated, and constituting a bearing for the stylus. The collar 15 prevents longitudinal motion of the stylus to such extent as would displace its end from the hole 17.

15 Stops 21, 22 are provided to limit the rocking motion of the rubbing point 13 of the stylus. In the construction illustrated in the drawings these stops are formed by cutting a groove 23 in piece 24 projecting from the socket and which may be made in one piece therewith.

In use the free end of the stylus rests upon the tablet (represented by the curved line 25, Fig. 1) in advance of the shank or stem, so that the point 13 can freely swing in an arc about the axis of the stem, and track or follow faithfully the groove in the record, without regard to slight irregularities in the latter, or divergencies between its pitch and that of the feed screw. At the same time the motions of the stylus are communicated directly and in their entirety to the diaphragm, the result being that scraping noises are largely eliminated, and the recorded sounds are reproduced with much greater distinctness and with undiminished loudness.

Figs. III, IV and V show different ways of mounting the end of the stylus. In Fig. III the end is bored out and fits over a conical-pointed pin 26 secured in the socket 10. The construction shown in Fig. IV is similar to that of Fig. III, while the construction of Fig. V presents a slight modification of that illustrated in Fig. I.

45 In Fig. VI the stem of the stylus 12 is tapered like the shank of a sewing-machine needle, and the metal socket 10 is drilled out to a diameter slightly larger than the stem. After the latter is inserted, the mouth of the socket is contracted upon the tapering stylus to hold it in place while permitting it to turn freely on its axis.

Figs. VII and VIII illustrate a construction which is within the principle of the invention, but is not so easily made as the form first described. The stylus 12, instead of oscillating on the axis of the stem is rigidly secured in its socket or support 10, the latter being pivoted in ears or brackets 28 attached to the diaphragm. The axis of oscillation is thus in a plane parallel with the diaphragm, or perpendicular to the stem of the stylus. The end of the latter projects through a slot 29 in the diaphragm, the ends of the slot serving as stops to limit the movement of oscillation of the rubbing point.

The foregoing description with the drawings referred to will suffice to determine the scope of the invention, and to show that many modifications in its form and details may be made without departing from the spirit thereof.

Having now fully described my said invention, what I claim is—

1. A reproducer having the stylus mounted upon the diaphragm the connection being rigid in the direction of the thrust of the stylus, and oscillatory in a direction transverse thereto, substantially as described.

2. The combination with the reproducer diaphragm, of a stylus carried by said diaphragm and having a pivotal or swiveled connection upon which its contact point can oscillate freely transversely to the groove of the record, substantially as described.

3. In a reproducer, a stylus having its rubbing point bent at an angle from the stem, and swiveled in the line of the stem, substantially as described.

4. The combination with the reproducer diaphragm of a stylus pivoted in a support or socket carried by said diaphragm so as to be capable of oscillation upon an axis perpendicular to the latter, substantially as described.

5. The combination with the diaphragm, of a tubular socket or support rigidly attached thereto, and a stylus having its free end bent at an angle to the stem, and being swiveled in said socket so that the point can oscillate about the axis of the stem, substantially as described.

6. The combination with the diaphragm of a stylus composed of a cylindrical steel wire, rounded at its end to form a contact point, and bent to throw the point out of line with the stem, said stem being perpendicular to and pivotally connected with the diaphragm, substantially as described.

7. The combination with the diaphragm, of a tubular socket attached thereto and closed at one end, a stylus having a straight stem portion inclosed in said socket and having a bearing upon a point at the closed end of the socket, so that it can turn upon its axis with slight friction, and a deflected portion outside of the socket upon the end of which is the rubbing point, substantially as described.

8. The combination with the diaphragm of the stylus swiveled on the axis of its stem in a support carried by said diaphragm, and stops embracing, and limiting the movement of the free end of the stylus, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CHARLES S. TAINTER.

Witnesses:

PERCIVAL L. WATERS,
PHILIP MAURO.

W. BRUENING.
PHONOGRAPH.

No. 511,402.

Patented Dec. 26, 1893.

Fig. 1

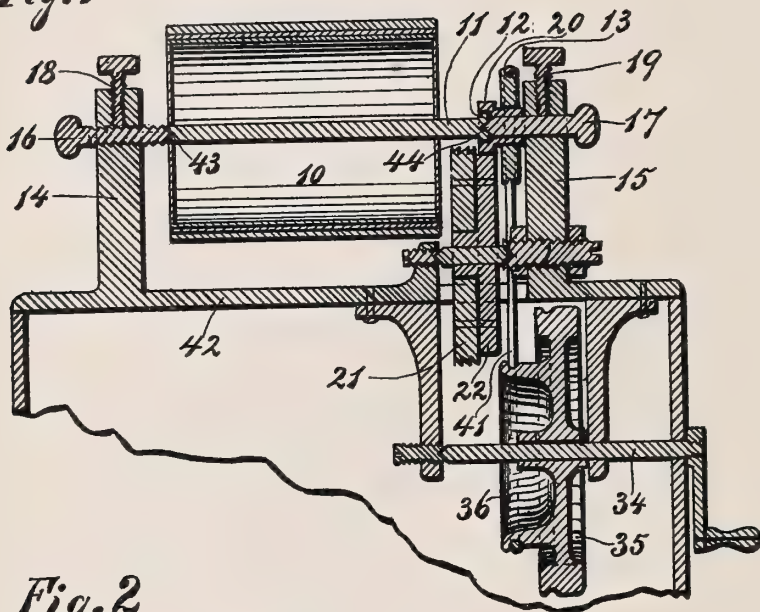


Fig. 4



Fig. 2

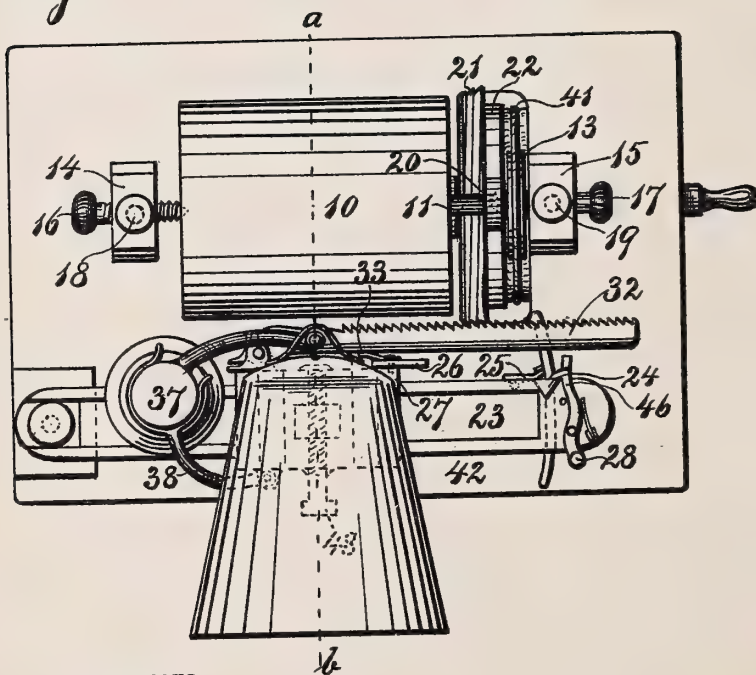


Fig. 5



WITNESSES:

Asa S. Pike
Charles S. Williams

INVENTOR

William Bruening

W. BRUENING.
PHONOGRAPH.

No. 511,402.

Patented Dec. 26, 1893.

Fig. 3

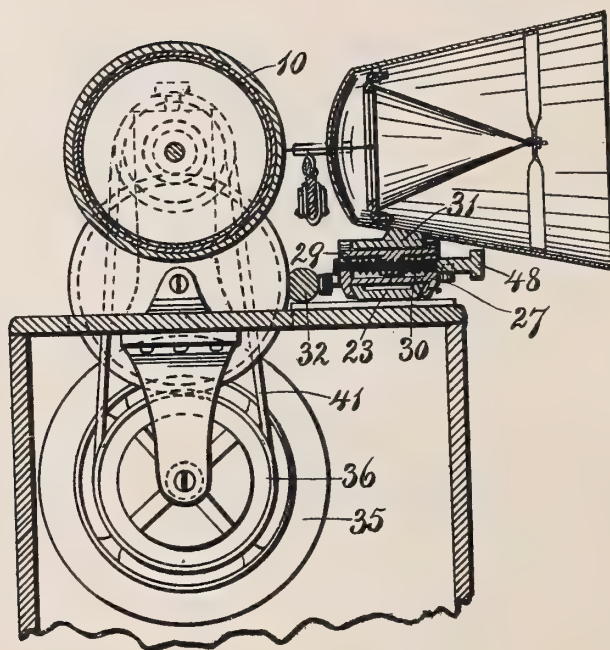


Fig. 6

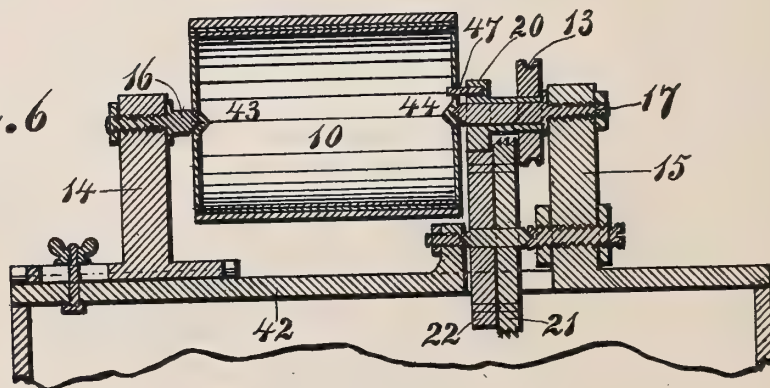
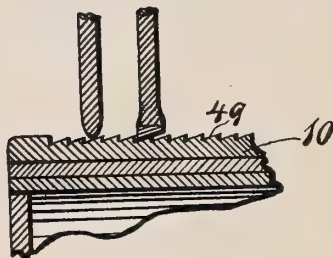


Fig. 7



WITNESSES:

Asa S. White
Charles S. Williams

INVENTOR

William Bruening

UNITED STATES PATENT OFFICE.

WILLIAM BRUENING, OF EAST ORANGE, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 511,402, dated December 26, 1893.

Application filed June 20, 1893. Serial No. 478,236. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRUENING, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to improvements in phonographs and has for its object to obtain a cheap and efficient mechanism for recording and reproducing sounds and consists in attaching a rack which engages with a rotating worm wheel to a slide rest carrying the recorder or reproducer, to cause longitudinal motion thereof on a slide or bed held parallel to the cylindrical surface of a tablet; in an improved shape of the track or tracks forming the record which may be reproduced by a style the point of which is not necessarily of the same shape or which may be wider than the record track, and in an improved shape of the point or end of the style with which such record is made.

In the accompanying two sheets of drawings which form part of this specification, Figure 1 is a vertical central section of the mechanism. Fig. 2 is a top view of the mechanism. Fig. 3 is a vertical cross-section on line *a-b* Fig. 2. Fig. 4 is an enlarged elevation of part of the style. Fig. 5 is a longitudinal section of part of the enlarged style on line *c-d*, Fig. 4. Fig. 6 is a central vertical section showing a different arrangement of engaging the tablet with the rotative mechanism. Fig. 7 is a vertical enlarged section of part of the tablet showing an exaggerated view of the ratchet-shaped record tracks in cross-section and parts of different enlarged reproducing styles located thereon, one having a rounded point and the other a point wider than the track.

Similar numerals refer to similar parts throughout the figures.

The tablet 10, Figs. 1, 2, 3, and 6, may be a solid or hollow cylinder made of or coated with suitable recording material and is movably and detachably supported on its axis by pivots or centers and thereby held in proper relation to the rotative mechanism. I prefer to make the tablet of a hollow cylinder of tin plate, to the cylindrical surface of which a sheet of paper or other porous material is af-

fixed; a layer of recording material is then applied by rotating the cylinder in contact with melted or dissolved recording material; when a desired thickness of the material has adhered it is allowed to harden and may be turned true and smooth in a lathe or in the machine herein described and the tool used for this purpose may be heated if desired. An eccentric opening 47 in or an eccentric projection on one of the heads of the cylinder may be provided to engage with the rotative mechanism, as in Fig. 6, but I prefer to attach a bar 11 to the center of one of the cylinder heads and if desired the bar 11 may extend through the entire length of the tablet and form the axis thereof; see Figs. 1 and 2. The projecting end of the bar 11 is made angular or provided with a key 12 whereby it engages with an angular recess or a slot in the gear 20 or other attachment of the pulley 13.

The frame 42 is provided with standards 14 and 15, which support the rods 16 and 17; one of the standards may be movable, see Fig. 6, but I prefer to make the rods adjustable, which may, if desired, be provided with screw-threads to engage with an internal thread on the sockets and are held in place by the set-screws 18 and 19 and the ends of said rods form the centers 43 and 44, on which the tablet is axially supported and rotated; the rod 17 also carries the pulley 13 and the attached gear 20. The wormwheel 21 is pivoted or journaled in the standard 15 and in a projection of the frame 42 and has a gear 22 attached which engages with the gear 20.

The movable bed or slide 23 may be of any usual construction and is shown in Fig. 2 as a bar provided with ways which is pivoted at one end to the frame 42 and is provided at its other end with a latch 46 by which it may be secured to the post 24 which is attached to the frame and thereby held parallel to a line between the centers 43 and 44; a spring moves the slide a desired distance outwardly to disengage the rack and worm and the style and tablet when the latch is released by contact with the projection 26 on the slide rest 27 or by moving the thumbpiece 28.

The slide rest 27 moves longitudinally on the slide 23 and is provided with a plate 29 which may be moved transversely by turning

the screw 30 in the nut attached to its lower side and is provided on its upper side with a channel or recess to retain a lug 31 which is attached to the frame of the recorder or reproducer; the screw 30 is held at its ends in the frame 27 and has a handpiece 48.

The rack 32 is movably attached at one end to the slide rest 27 and an intermediate spring 33 holds it against the wormwheel 21 when the slide 23 is in position.

The hangers on the lower side of the frame support a shaft 34 provided with a flywheel 35 and a pulley 36 which is connected with the pulley 13 by the belt 41.

Hand or any other power may be used to give motion to the mechanism.

When it is desired to use a heated style for the purpose of melting or fusing a record into the tablet, the lamp 37 is supported by a holder mounted on the pivoted rod 38 with which it may be moved to bring the flame into position to heat the style and may be moved aside when the record is completed, or an electrically heated style, such as set forth in my Patent No. 486,394, issued November 15, 1892, may be used instead.

The recorder or reproducer may be of any usual construction but I make the end or operative part of the recording style as follows: The broad side of the flattened end of the style is rounded or beveled by grinding or in any other convenient manner to an edge which is mounted and held against the tablet so as to form an acute angle with the surface and in the direction of the axis thereof; I prefer to give the end of the style a shape similar to that of a skew-chisel, see Fig. 4, which permits the body of the style to be held at right angles to the surface of the tablet. This style may be used to cut a sound record in resisting material and in that case the edge is held with the flat side of the style toward the advancing material of the rotating tablet, but when fusing or melting a record in fusible material with a heated style the rounded or beveled side of the style is preferably presented to the moving recording material, thereby bringing a greater heated surface in contact with the fusible material, the edge of the style touching it last and determining the shape of the record track by moving the viscous material out of its path. The track 49 thus formed, see Fig. 7, is ratchet-shaped or in other words presents in cross-section a surface inclined to the axis of the tablet and is terminated by a vertical or approximately vertical wall, the surfaces of the successive tracks lying in parallel planes, and is applicable also to flat, curved or reciprocating tablets. The elevations and depressions corresponding to sound vibrations in a record thus made extend the entire width of the track and will therefore cause the motion of a reproducing style, whether the point thereof is rounded or of the same shape as and wider than that of the recording style and the successive tracks may be made closer to each

other than by other means heretofore used without diminishing the efficiency of reproduction, as no inoperative ridges or partitions intervene.

I prefer to use a reproducing style provided with an end or point of the same shape and size as that of the recording style herein described, as the rounded or beveled surface glides smoothly over and readily accommodates itself to the record while if any part of said surface projects beyond the track, such part will not bear on the adjacent record because its contour is not in the same plane therewith.

To record sounds, the tablet 10 is placed in position by adjusting the centers 43 and 44 to support it at its axis and bring the end of the bar 11 in engagement with the slot in the gear 20 and securing the rods 16 and 17 in position by the setscrews 18 and 19. The diaphragm and style, which in the drawings is shown as the recorder in my Patent No. 468,608, issued November 22, 1892, and provided with a style point as herein described, but which may be substituted by a recorder of any other suitable construction, is attached to the slide rest by inserting and securing the lug 31 on the frame of the diaphragm in the recess in the plate 29. The slide rest 27 is moved into the desired position on the slide 23 and the latter is moved until it is in contact with the post 24 to which it is secured by the latch 46 which brings the rack 32 into engagement with the worm wheel 21.

Motion is given the mechanism by revolving the pulley 13 by means of the belt 41 connecting it with the pulley 36 or any other motor which causes the tablet to rotate on its axis on the centers 43 and 44. The gear 20 engaging with the gear 22 causes rotation of the worm wheel 21, which may have a right or left hand thread according to the direction desired in making the record, which causes the rack 32 to move the slide rest 27 with the attached recorder longitudinally on the bed 23 and parallel to the tablet surface; the style having been adjusted by turning the screw 30 until the style point penetrates the material of the tablet to a desired depth and sound being caused to operate on the diaphragm through the horn or mouthpiece, a spiral record will be formed in the material of the tablet by the vibration of the style.

To heat the style, the lamp 37 is swung on the rod 38 until the flame is under the style and the heat thereof may be regulated to any desired intensity.

To reproduce a record, a reproducer is substituted for the recorder and the lamp removed.

In employing removable phonograph tablets which dispense with a separate carrier and are provided with axial bearings which revolve on a fixed rod or bar, as set forth in my Patent No. 499,370, issued June 13, 1893, frequent use will cause the wear of the bar and bearings by abrasion and will result in

unequal motion of the surface of the tablet and consequently in faulty reproduction; in this invention the adjustable centers take up all wear and equal motion is maintained with but a minimum of friction. The rack and worm-wheel answer the purpose of a costlier fine-threaded screw heretofore used. The movable slide allows the style to be readily shifted to any part of the record or tablet and the slide rest may be adjusted to accommodate recorders or reproducers of various construction; by the use of a recording style which is provided with an end or point as herein set forth a record is produced the tracks of which may be closer together than where a ridge or partition separates them, thereby economizing space, and which may be reproduced by a reproducing style the point of which need not be of the same shape or narrower than that of the recording style, as in records heretofore made, while the mechanism is of simple construction and may be cheaply made and adapted to record sound by any of the known methods.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a phonograph, a frame provided with adjustable centers or pivots, a cylindrical tablet which is axially supported by said centers or pivots and means for rotating said tablet thereon in combination with a movable slide or bed, a slide rest carried by said slide or bed,

a recorder or a reproducer adjustably secured to said slide rest, a rack attached to said slide rest, a wormwheel and means for rotating said wormwheel, substantially as described.

2. In a phonograph, a style capable of vibration and provided with a skew-chisel shaped point or end in combination with a diaphragm or other means of transmitting sound vibrations to said style, substantially as described.

3. In a phonograph, a tablet provided with a record of sound vibrations which consists of a ratchet-shaped track or tracks having elevations and depressions corresponding in form to said vibrations, substantially as described.

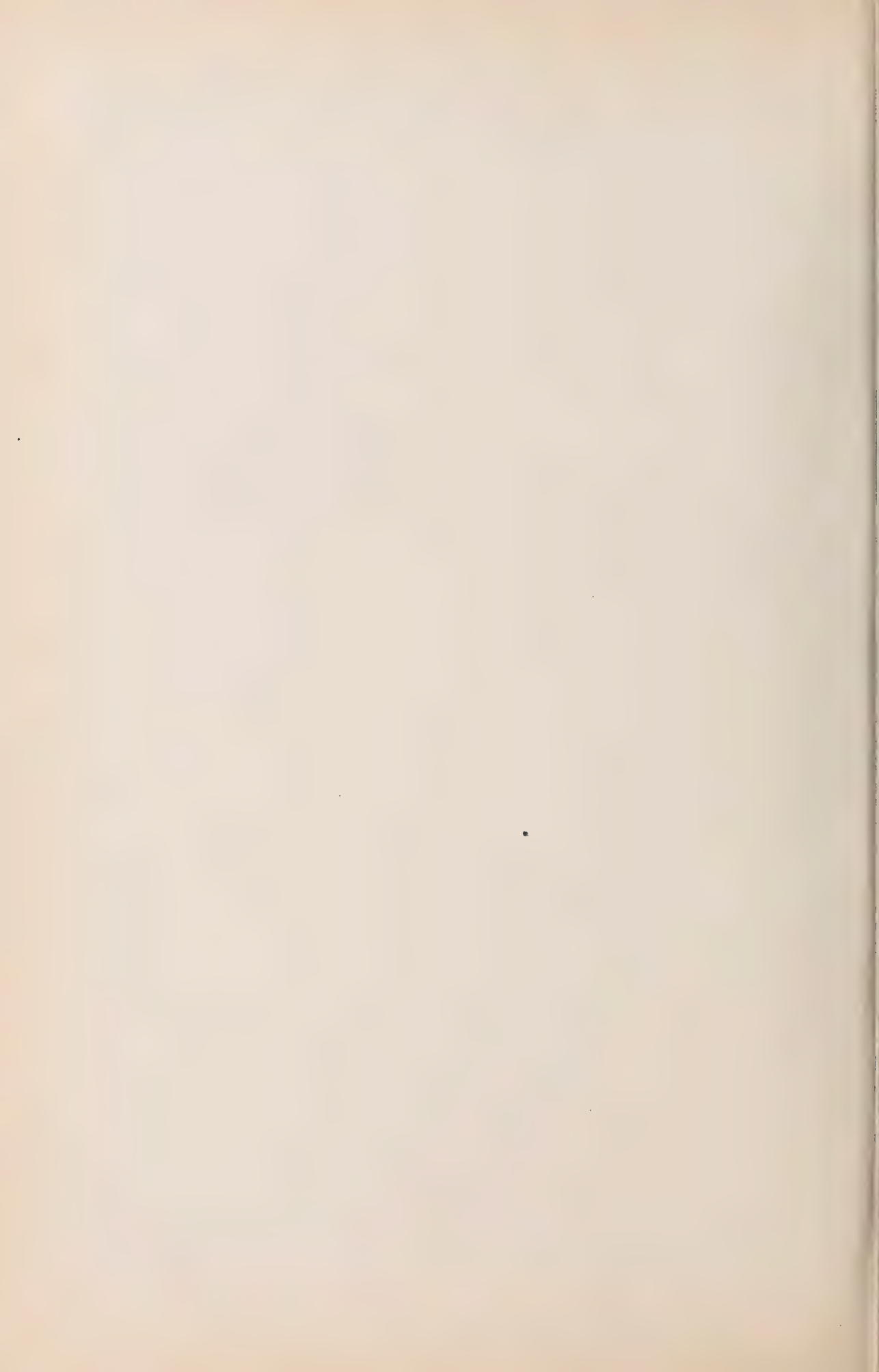
4. In a phonograph, a cylindrical tablet provided with a record of sound vibrations which consists of undulations of the surface of a spiral track which in cross-section is inclined to the axis of said tablet and forms an angle with a vertical or approximately vertical wall, said undulations corresponding in form to said vibrations, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 19th day of June, 1893.

WILLIAM BRUENING.

Witnesses:

CHARLES S. WILLIAMS,
MONTGOMERY LINDSAY.



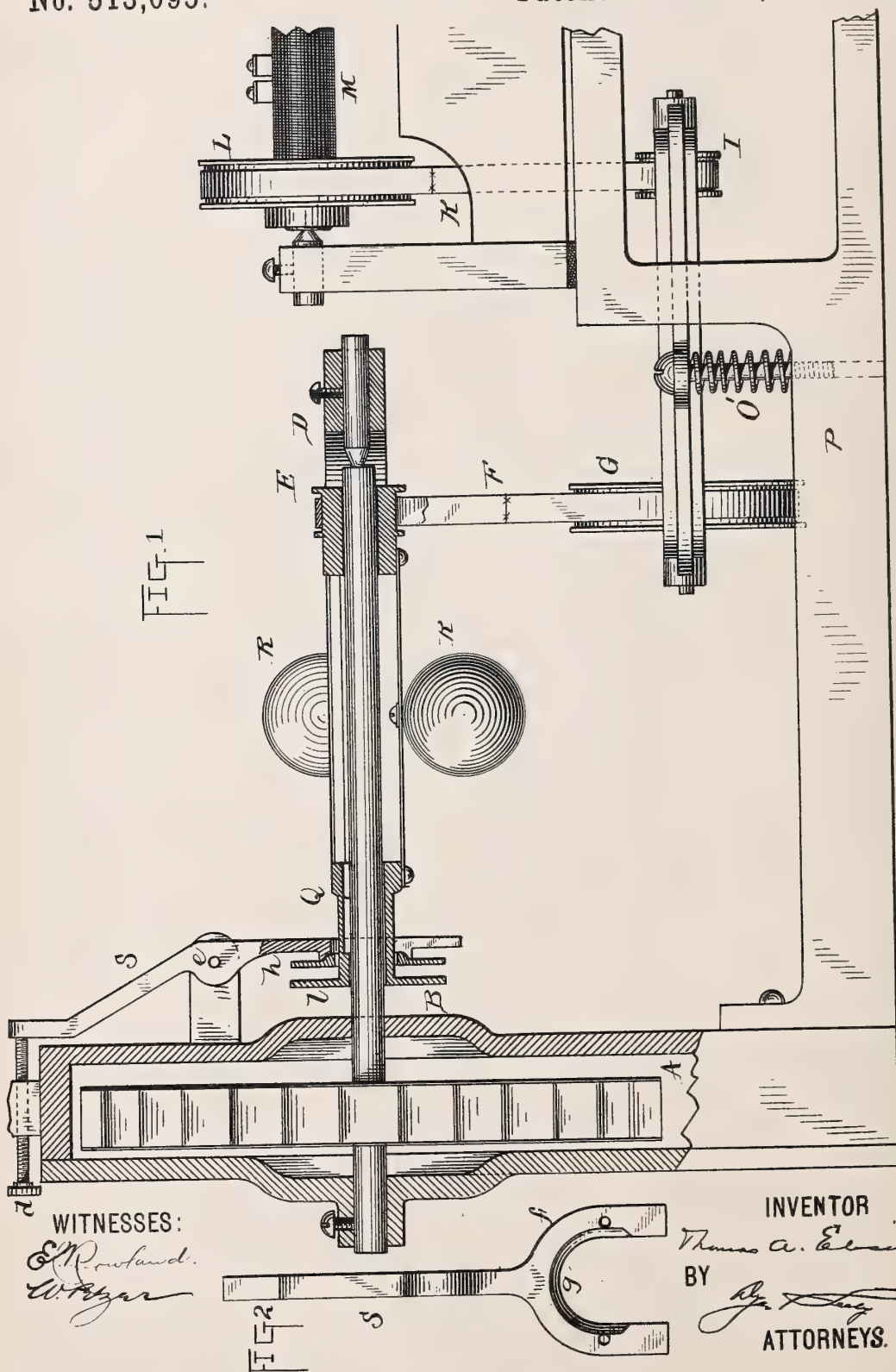
(No Model.)

3 Sheets—Sheet 1.

T. A. EDISON.
PHONOGRAPH.

No. 513,095.

Patented Jan. 23, 1894.



(No Model.)

3 Sheets—Sheet 2.

T. A. EDISON.
PHONOGRAPH.

No. 513,095.

Patented Jan. 23, 1894.

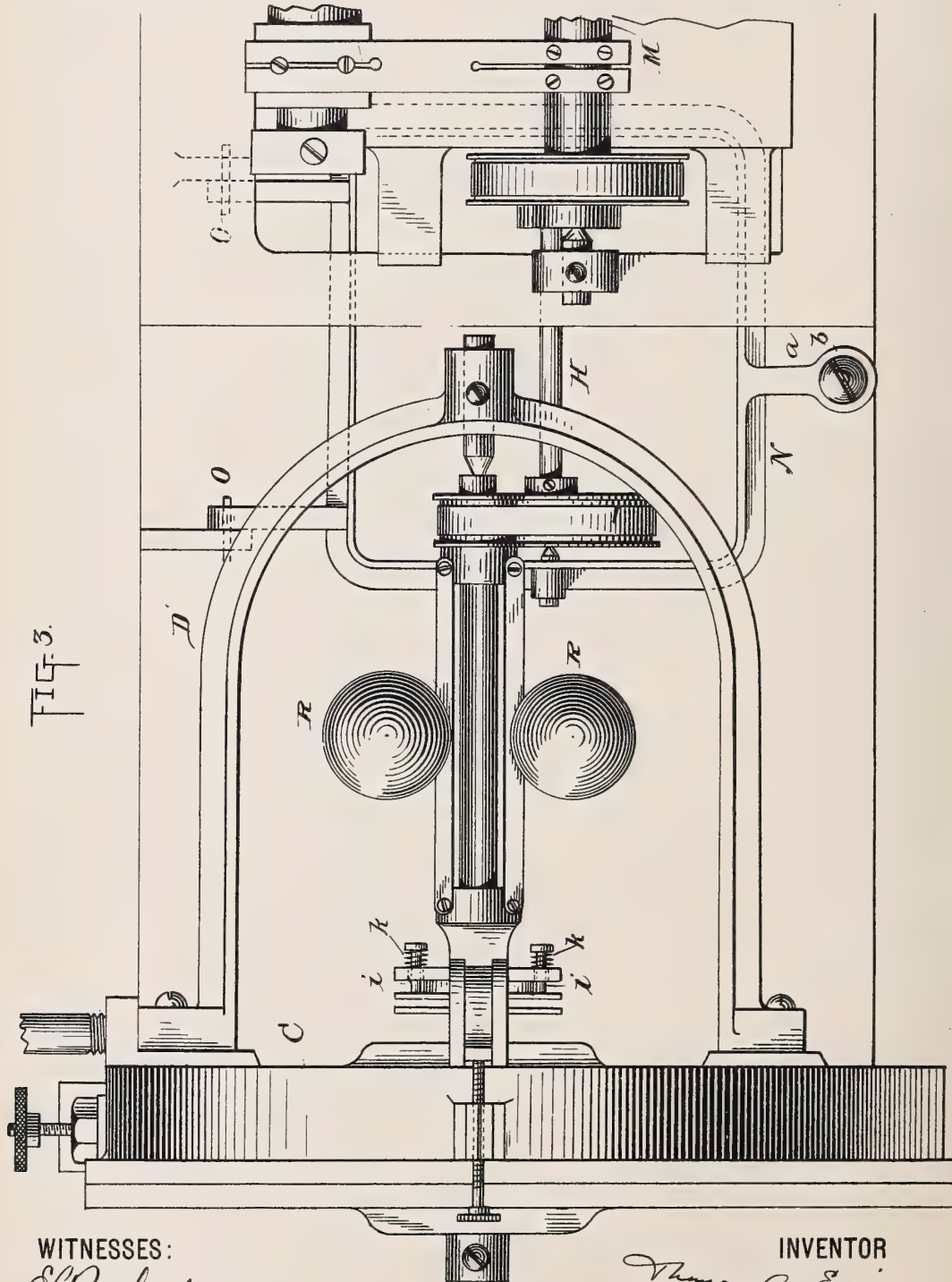


FIG. 3.

WITNESSES:

E. Rowland
W. F. Gilger

INVENTOR

Thomas A. Edison

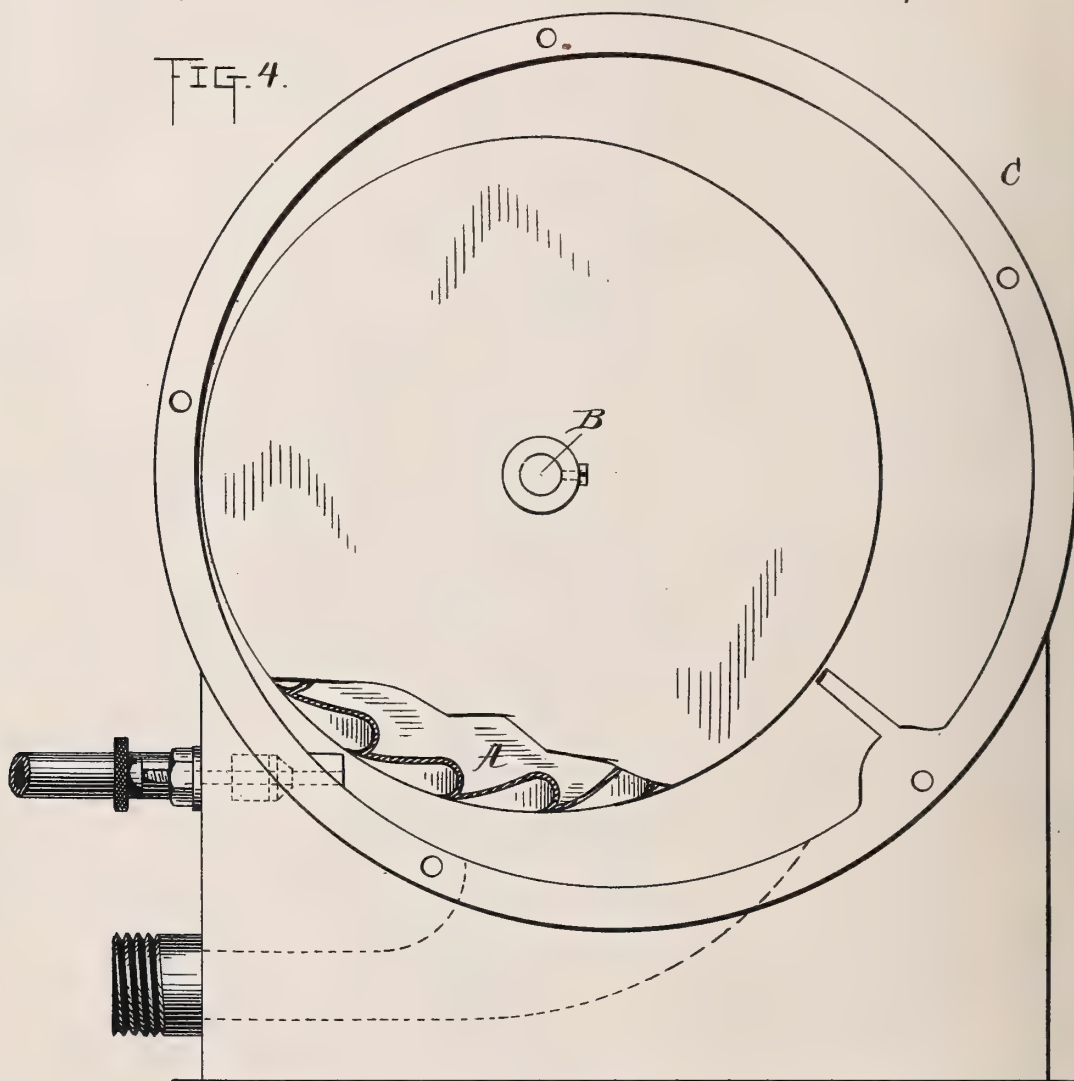
BY

Ben. J. Coffey
ATTORNEYS.

T. A. EDISON.
PHONOGRAPH.

No. 513,095.

Patented Jan. 23, 1894.



WITNESSES:

E. L. Rowland
W. H. Rizer

INVENTOR

Thomas A. Edison

BY

J. A. [Signature]

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 513,095, dated January 23, 1894.

Application filed December 27, 1889. Serial No. 335,140. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 849,) of which the following is a specification.

This invention relates to motors for operating phonographs, to the connections between such motors and the phonograph itself, and to the devices for regulating the speed of the phonograph. I have heretofore usually employed an electric motor connected by belts with the feed screw of the phonograph and provided with a governor for regulating the speed which operated by breaking the motor circuit temporarily when the speed became too great. In my present invention I make use, preferably, of a hydraulic motor or water wheel placed on a shaft parallel with the feed screw and connected by belts and a counter-shaft which reduce the speed, with said feed screw. In connection with the motor I employ a centrifugal governor operating by the application of friction to a turning part and I make use of a loose friction shoe as one of the friction surfaces which always seats itself perfectly on the application of the friction and so makes the governing accurate and even.

My invention further includes a simple and effective arrangement for maintaining tension on the belts which connect the motor with the feed screw and for adjusting said tension when required.

My invention is illustrated in the accompanying drawings.

Figure 1 is a side elevation and partial section of the motor and governor and the connecting devices; Fig. 2, an elevation of the adjustable arm of the governor; Fig. 3, a top view of the motor governing and connecting devices, and Fig. 4, an end view of the motor with part of the case removed.

I have shown a simple form of water wheel A placed on the shaft B within the case C. A bracket D extends from the case C and supports the outer end of the shaft B. Upon said shaft is a pulley E connected by a belt F with a grooved wheel G on a spindle H which has also upon it a pulley I connected by a belt K with a grooved wheel L on the phonograph

feed screw M, which, as will be understood, carries the phonogram cylinder (not shown). The wheels G and I are supported in bearings on a frame N, the rear portion of which is hinged at O. A lug *a* extends from the front of the frame N and through this passes a screw *b* which enters the supporting base P of the machine.

Upon the screw *b* between the base P and frame N is coiled a spring O' so that the frame N is supported upon said spring and may be adjusted upon its hinges by adjusting the screw *b* to alter the tension of said spring. The pulleys G and I being supported by the movable frame N below the relatively stationary pulleys E and L, it will be seen that the tension of the belts F and K is dependent upon the height to which said frame is adjusted and that the belts may therefore be both tightened or loosened by screwing the screw *b* in or out.

Upon the shaft B is placed the sliding sleeve Q to which are attached the governor balls R. An arm S rests at its upper end against an adjusting screw *d*, is pivoted at *e* and terminates at a fork *f* through which the shaft B and sleeve Q pass. The fork *f* has on its face a curved rim *g* within which is a flanged disk *h* placed loosely over the sleeve Q. The disk *h* is held by pins *i* which pass loosely through the sides of the fork *f* and springs *k* are placed between the fork and the heads of said screws, so that the disk *h* is enabled to yield and to rock back toward the fork *f*, being however normally held parallel to the fork by the springs; at the inner end of the sleeve Q is a disk or flange *l*. It will be seen that when the speed of the motor becomes too great the governing balls will fly out and draw the disks *l* against the disks *h* whereby a friction is produced which will retard the motion and slacken the speed. The friction regulation shown and described is particularly adapted to use with the phonograph in which it is necessary that the regulation shall not be of uneven or jerky character.

While it is not essential in the phonograph that the speed shall be absolutely constant at all times, it is necessary for the best reproduction and especially for the reproduction of music that the speed of any short interval

of time shall be substantially the same, that is for instance, that during any one revolution of the phonograph there shall be no substantial change of speed, since an alteration
 5 of speed under such circumstances will alter the pitch of the sound and so destroy any musical effect; by employing the loose friction shoe which will always engage the turning disk in the same position because it seats
 10 itself perfectly at all times against it this result is accomplished. With rigidly supported disks the necessary inaccuracies in mechanical construction will cause uneven friction at different parts of the same revolution and so
 15 the speed will vary at these times; but with the arrangement described the degree of friction will remain the same during the whole revolution. The degree of speed at which the friction will be applied may be determined by
 20 adjusting the screw *d* so as to move the fork *f*.

The use of this character of governor is also particularly applicable to the operation of phonographs by water motors in which the speed is apt to be varied in consequence of
 25 variations in pressure and in which the ordinary mode of regulation by cutting off the supply will be likely to produce irregular variations of speed.

What I claim is—

30 1. In a phonograph, the combination of the feed screw, a rotating motor having its shaft geared to said feed-screw, a centrifugal governor on the motor shaft, a friction disk connected with the governor, and another fric-

tion member with which said friction disk 35 engages, one of said friction members being a rocking shoe, substantially as set forth.

2. In a phonograph, the combination of the feed-screw, a rotating motor having its shaft geared to said feed-screw, a centrifugal gov- 40 ernor on the motor shaft, a friction disk connected with the governor, and a rockingspring supported stationary disk with which said friction disk engages, substantially as set forth.

3. In a phonograph, the combination of the feed screw, a rotating motor having its shaft geared to the feed screw, a centrifugal gov- 45 ernor on the motor of the shaft, a friction disk connected with the governor, and another friction disk the same being stationary and pivoted and provided with a yielding support enabling it to rock on its pivot, substantially as set forth.

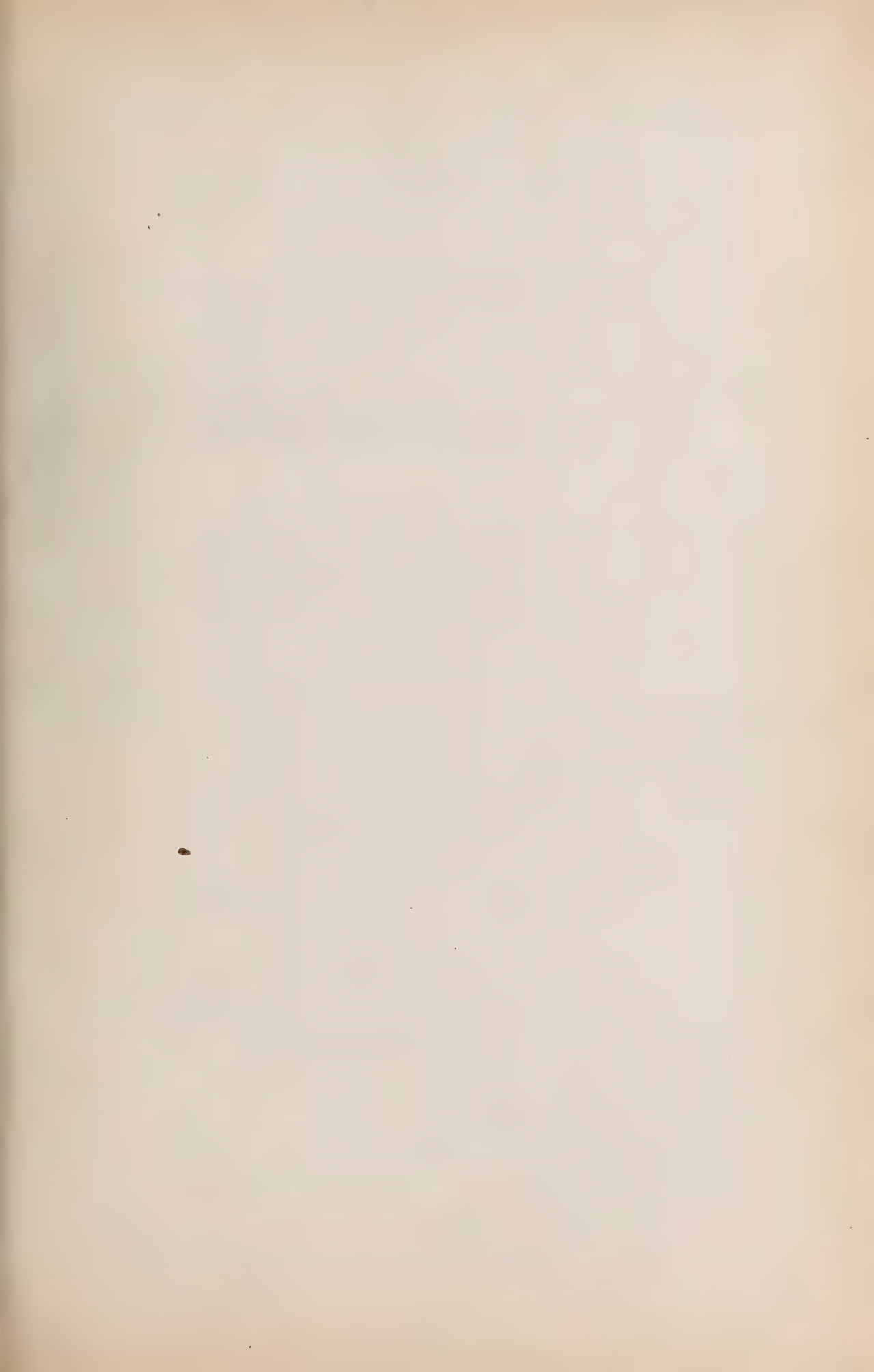
4. In a phonograph, the combination of the 55 feed-screw, the rotating motor, the pulley on the shaft of the feed-screw, the pulley on the motor shaft, the two intermediate pulleys, the connecting belts and the adjustable frame carrying said intermediate pulleys, substan- 60 tially as set forth.

This specification signed and witnessed the 11th day of December, 1889.

THOS. A. EDISON.

Witnesses:

D. H. DRISCOLL,
 W. PELZER.

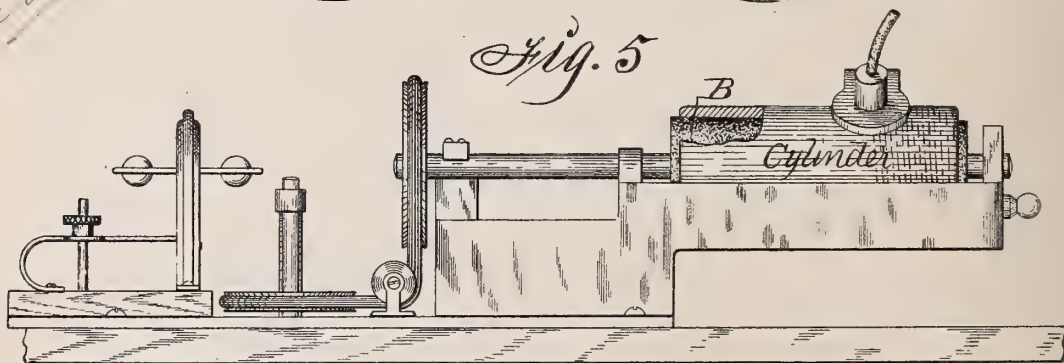
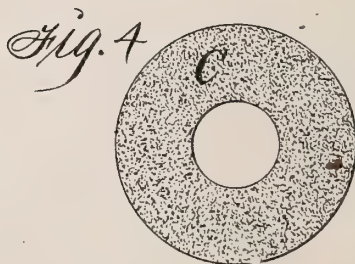
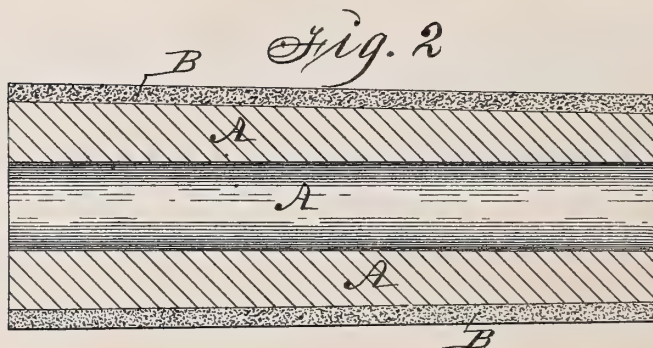
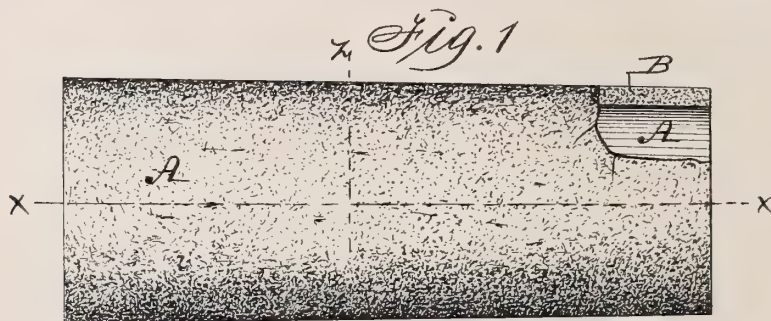


(No Model.)

A. D. ANDREWS.
MANDREL FOR PHONOGRAPHS.

No. 515,811.

Patented Mar. 6, 1894.



Witnesses: { Inventor: Arnette D. Andrews,
W. J. Sankey.
R. H. Orwig. } By Thomas G. Orwig, Attorney.

UNITED STATES PATENT OFFICE.

ARNELLE D. ANDREWS, OF DES MOINES, IOWA.

MANDREL FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 515,811, dated March 6, 1894.

Application filed January 2, 1892. Serial No. 416,804. (No model.)

To all whom it may concern:

Be it known that I, ARNELLE D. ANDREWS, a citizen of the United States of America, residing at Des Moines, in the county of Polk and State of Iowa, have invented an Improved Mandrel for Phonographs, of which the following is a specification.

My object is to avoid the difficulties and annoyances incident to the use of phonogram blanks upon metal mandrels. When the metal is warm and expanded the blanks made of wax and analogous substances adhere too closely to be easily removed and when the metal is cold the blanks are too loose to remain stationary on the mandrel while the machine is in operation.

My invention consists in providing a mandrel with an elastic surface that will not be affected by the temperature and upon which blanks can be readily and securely placed and also readily removed as required in the use and operation of interchangeable blanks.

My invention is illustrated in the accompanying drawings and pointed out in my claims.

Figure 1 is a surface view of a mandrel that has a solid core and a piece of non-metallic and elastic covering removed to disclose the solid interior. Fig. 2 is a sectional view through the line *xx* of Fig. 1. Fig. 3 is a transverse sectional view through the line *zz* of Fig. 1. Fig. 4 is a transverse section of a composite cylinder that has an elastic surface. Fig. 5 is a side view of a phonograph showing my improved mandrel in position as required in practical use to support a cylinder or phonogram blank.

A, shown in Figs. 1, 2, and 3, represents the solid core of a mandrel and B a nonmetallic and elastic tube fixed and fitted over the core. The core or central portion A of the mandrel may be made of wood, metal, or other suitable material, and vary in size as desired. The nonmetallic and elastic cover B is preferably made of rubber but it may be made of cork or other suitable material in the form of a tube that can be fitted and placed over the core A in such a manner that it will remain securely fastened thereto by its contractile force.

C shown in Fig. 4 represents a mandrel

formed complete in one piece of cork, rubber, or other nonmetallic and elastic material. When made of rubber the interior can be vulcanized so as to make it rigid and solid while the exterior portion remains elastic. The diameter of one end of the mandrel is larger than the other end as required to produce a tapering body.

I am aware mandrels have been tapering and complete in one piece, but in no instance has a mandrel for phonographs been made complete in one piece with an outside smooth and elastic surface and in no instance has an elastic covering been combined with the solid core of a mandrel to adapt it for applying, retaining and removing advantageously a phonogram blank that is susceptible to the temperature of the metal surface of a mandrel.

In the practical use of my improved mandrel cylindrical blanks, adapted to be indented by a vibrating point and corresponding in size and shape with the mandrel, can be readily slipped on and off the non-metallic and elastic surface of the mandrel. The elasticity of the surface cover of the solid part of the mandrel allows the diameter of the mandrel to be slightly diminished by pressure as the tube or cover is being pressed on and when in proper position the expansive force of the compressed material will cause the cylinder to adhere securely as required to prevent it from moving relative to the mandrel while in operation. And the same elastic surface of the mandrel allows the cylinder blank to be readily moved longitudinally on the mandrel as required to remove it therefrom.

I claim as my invention—

1. A mandrel for phonographs made complete in one piece and its interior rigid and its outside surface elastic, substantially as and for the purposes stated.

2. A mandrel for phonographs that has an exterior elastic surface and its interior rigid to operate in the manner set forth, for the purposes stated.

ARNELLE D. ANDREWS.

Witnesses:

J. RALPH ORWIG,

THOMAS G. ORWIG.

(No Model.)

H. L. SANBORN.
PHONOGRAPH.

No. 517,072.

Patented Mar. 27, 1894.

Fig. 1

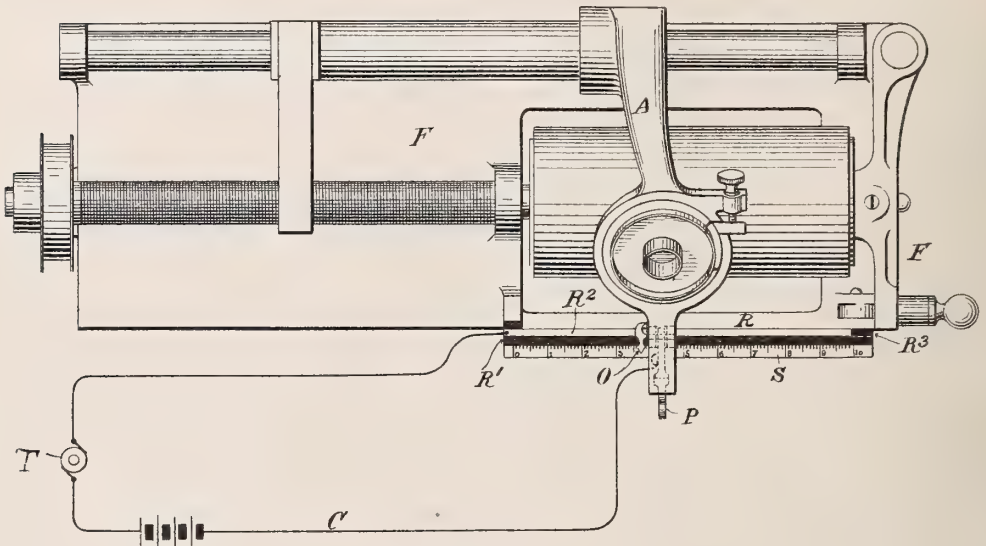


Fig. 2

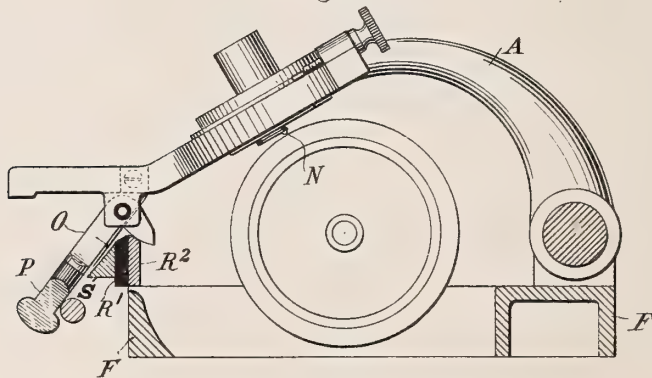


Fig. 3

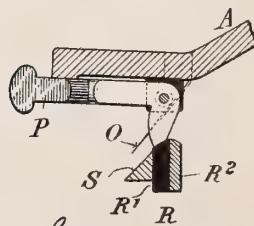
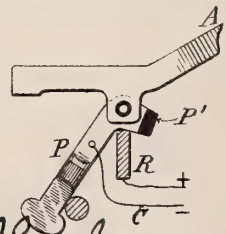


Fig. 4



Witnesses
Raphael Vetter
Edward S. Berrall

Hermann Ford Sanborn Inventor

UNITED STATES PATENT OFFICE.

HERMANN LORD SANBORN, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AUGUSTA L. SANBORN, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 517,072, dated March 27, 1894.

Application filed August 19, 1893, Serial No. 483,561. (No model.)

To all whom it may concern:

Be it known that I, HERMANN LORD SANBORN, residing in the city of Brooklyn, county of Kings, and State of New York, have invented a new and useful Improvement in Phonographs, (for which I have obtained no foreign Letters Patent whatever,) of which the following is a specification.

My invention relates to improvements in phonographs in which the diaphragm and needle are held in a movable arm forming part of a carriage and traversing the length of the cylinder.

The objects of my improvements are, to provide means, first, for automatically and at once setting the machine in motion by closing the motor circuit when the arm, diaphragm and needle are lowered and the contact of the latter with the cylinder is effected; second, for automatically and at once stopping the entire machine by opening the motor circuit in raising the arm carrying the diaphragm and needle, and, third, for automatically opening the motor circuit by the action of the machine itself or its own parts and thereby stopping the entire machine at or near the end of the cylinder and the limit of the motion of the arm, diaphragm and needle. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a top view. Fig. 2 is an end and part sectional view; and Figs. 3 and 4 are detail views, in part in section.

Similar letters relate to similar parts throughout the several views.

F is the frame of the machine shown in section in Fig. 2.

A is the usual arm carrying the diaphragm and needle.

P is the ordinary drop lever or finger piece, or its equivalent, through which the arm is supported on or by the sliding rest R, with the needle in or out of contact, as the case may be.

R is the slide rest, which has heretofore been made of metal. I make the slide rest R in two pieces, R' and R², the first composed of non-conducting material, the other of conducting material. With this slide rest the inner end of the bent lever finger piece makes contact in either one of two positions, one cir-

cuit making, the other circuit breaking. The part R² of the slide rest R made of metal is connected with or in an electrical circuit C, which operates the phonograph.

In Fig. 1 the circuit C is shown with its battery or source of electricity and in its proper relation to the slide-rest R² and phonograph arm A, and also to a motor shaft T which may be considered as representing the motor shaft of the machine although not shown as co-ordinated therewith.

R' is made of hard rubber, or of any other non-conducting material. The drop lever or finger piece P is also in circuit, as shown in Fig. 4, and becomes a key for opening or closing the motor circuit C.

If desired, instead of making a portion of the slide rest R of insulating material, the insulating material may be secured to the end of the finger piece P as shown at P' in Fig. 4, the contact being in that case made above the rubber end, in which case the slide rest may be made to consist of a bar of metal only, but in circuit. The finger piece P becomes, in fact, a key for opening and closing the circuit automatically as the diaphragm arm A is manipulated, and will support the arm A in either of those positions on the slide rest R.

At the end of the conducting part R² of the sliding rest I place a non-conducting piece or bar R³ as a part of the slide rest. When the finger piece P traverses the slide and reaches and rests upon R³, the motor circuit is automatically broken and the machine is automatically stopped. On its front side the slide rest R is beveled, as shown in Figs. 2 and 3 in sectional view, and is provided with a scale S as shown in Fig. 1. The beveled shape of the scale S is not essential, as it may have any other suitable form. The phonograph arm carries a pointer O so placed as to traverse the scale and indicate the position of the needle N.

The operation of the machine is as follows: When the finger piece is in the position shown in Fig. 2 the circuit C is closed, through the slide rest R, and the parts are in position for use, under the control of the circuit C. When the finger piece P, and the arm A with it, is lifted for any purpose so as to break the contact between the metallic finger piece P and

the slide rest R^2 , the circuit is broken and the machine instantly stops, so that when lowered again and contact made, the phonograph will start at the point where it left off on raising of the finger piece P, without omitting any of the writing on the cylinder or the necessity of carrying the needle back and repeating. By raising the finger piece P and dropping it with the arm A to the position shown in Fig. 3, the metallic part or end of the finger piece P rests upon the insulating material R' and the machine will remain at rest, but in juxtaposition, the circuit being open. The circuit will also be kept open when the finger piece P is constructed as shown in Fig. 4 and is raised so that the part P' rests upon the slide rest R. When the finger piece P reaches or is made to rest upon the non-conducting part R^3 of the slide rest R, the motor circuit is open and the machine is brought to or remains in a state of non-action. The finger-piece P is practically, in one respect only the switch for opening and closing the motor circuit at will, and the motor circuit does not necessarily have the usual or any other switch for that purpose. As such it is attached or connected to the phonograph or diaphragm arm in such a way as to be insulated therefrom and so related to the slide rest that either by lifting the phonograph arm, or by moving the finger piece so that its contact is made only with the non-conducting part of the slide rest, the motor circuit will be opened, and so related that the circuit may be closed by reversing these motions of the arm or of the finger-piece at will. The finger-piece is so shaped and related to the arm and rest that the movement of it automatically raises or lowers the arm without the intervention of any other mechanism and the relations are also such that the lifting of the arm itself by itself and alone operates the finger-piece considered as a switch, or the arm and finger-piece together considered as a switch. In fact, the arm itself becomes at will a switch for opening and closing the motor circuit. Consequently several functions and operations heretofore performed separately by separate devices are here performed by one new device and by one movement.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A phonograph arm A supporting a diaphragm, and a drop lever or finger piece P in

an electrical circuit, in combination with a slide-rest R provided with a non-conducting portion R' and conducting part R^2 .

2. A phonograph arm A supporting a diaphragm, and a drop lever or finger piece P in an electrical circuit, in combination with a slide-rest R provided with non-conducting portions R' R^3 and a conducting part R^2 also in the electrical circuit.

3. In phonographs, a finger piece P in motor circuit C, in combination with a slide-rest R consisting of non-conducting parts and a conducting part in circuit, substantially as shown and described.

4. A phonograph arm, a drop lever or finger piece secured thereto and located in the motor circuit of the phonograph as a circuit maker or breaker at will, and the electric motor circuit, in combination; substantially as shown and described.

5. A phonograph arm, a drop lever or finger piece secured thereto and located in an electric circuit, a diaphragm and needle supported by the arm, a slide-rest, a scale, a pointer and an electric phonograph motor circuit, in combination, substantially as shown and described.

6. A phonograph arm provided with a bearing that makes contact with the slide-rest for the arm, which bearing is in the electric motor circuit of the phonograph, and a slide-rest also in the same electric motor circuit, in combination.

7. A phonograph arm supporting a diaphragm, the slide-rest contact of which is in the motor electric circuit of the phonograph, in combination with a slide-rest provided with a conducting bar or part also in the electrical motor circuit except at or near one end where it is not in the electrical motor circuit, and with a non-conducting part or insulated portion all of which is out of the electrical motor circuit.

8. A phonograph arm supporting a diaphragm, the slide-rest contact of which is in the motor electrical circuit of the phonograph, in combination with a slide-rest provided with a conducting bar or part also in the electrical motor circuit, and with a non-conducting part or insulated portion.

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Witnesses:

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(No Model.)

4 Sheets—Sheet 1.

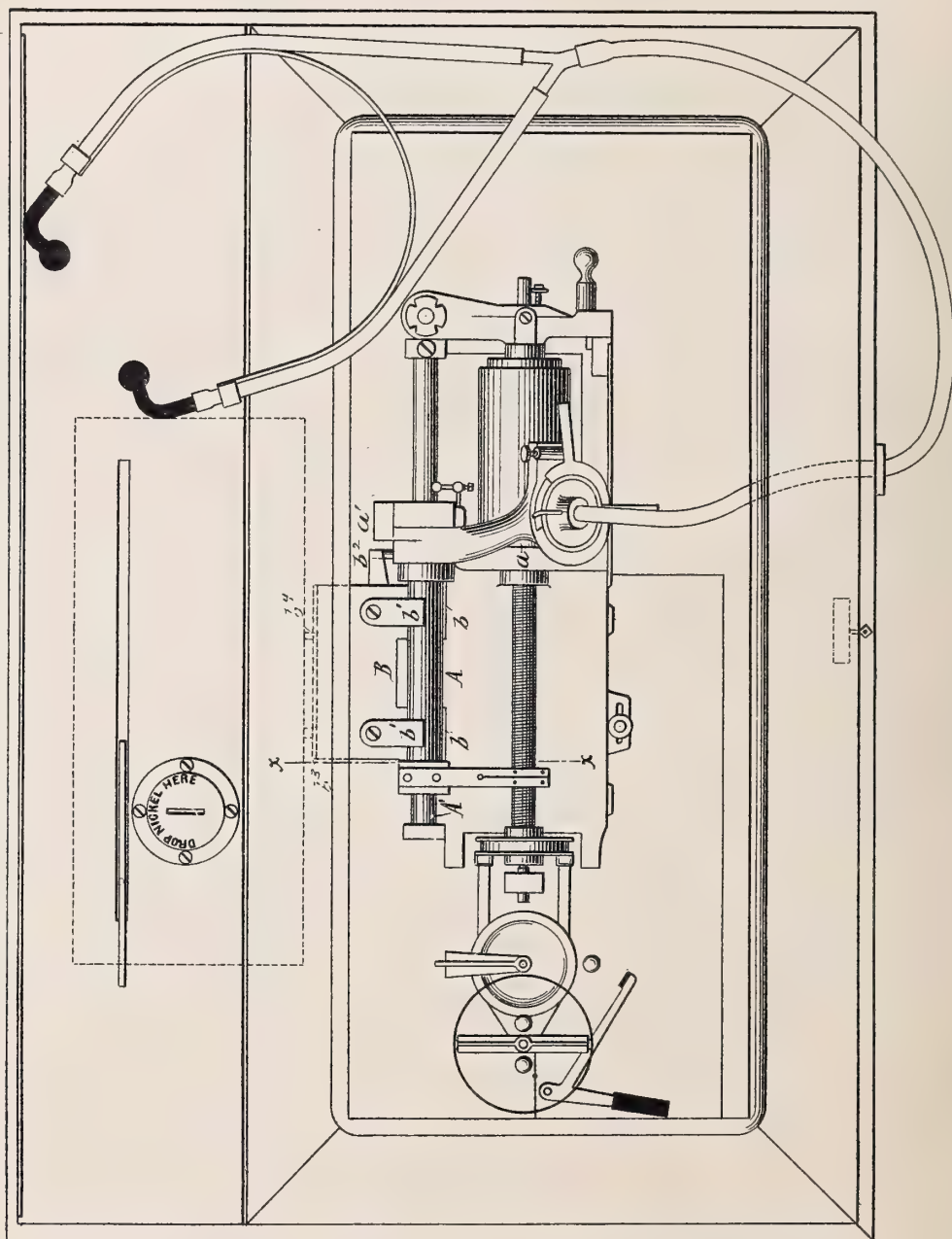
A. K. KELLER.

ATTACHMENT FOR OPERATING PHONOGRAPHS.

No. 518,190.

Patented Apr. 10, 1894.

FIG. 1.



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(No Model.)

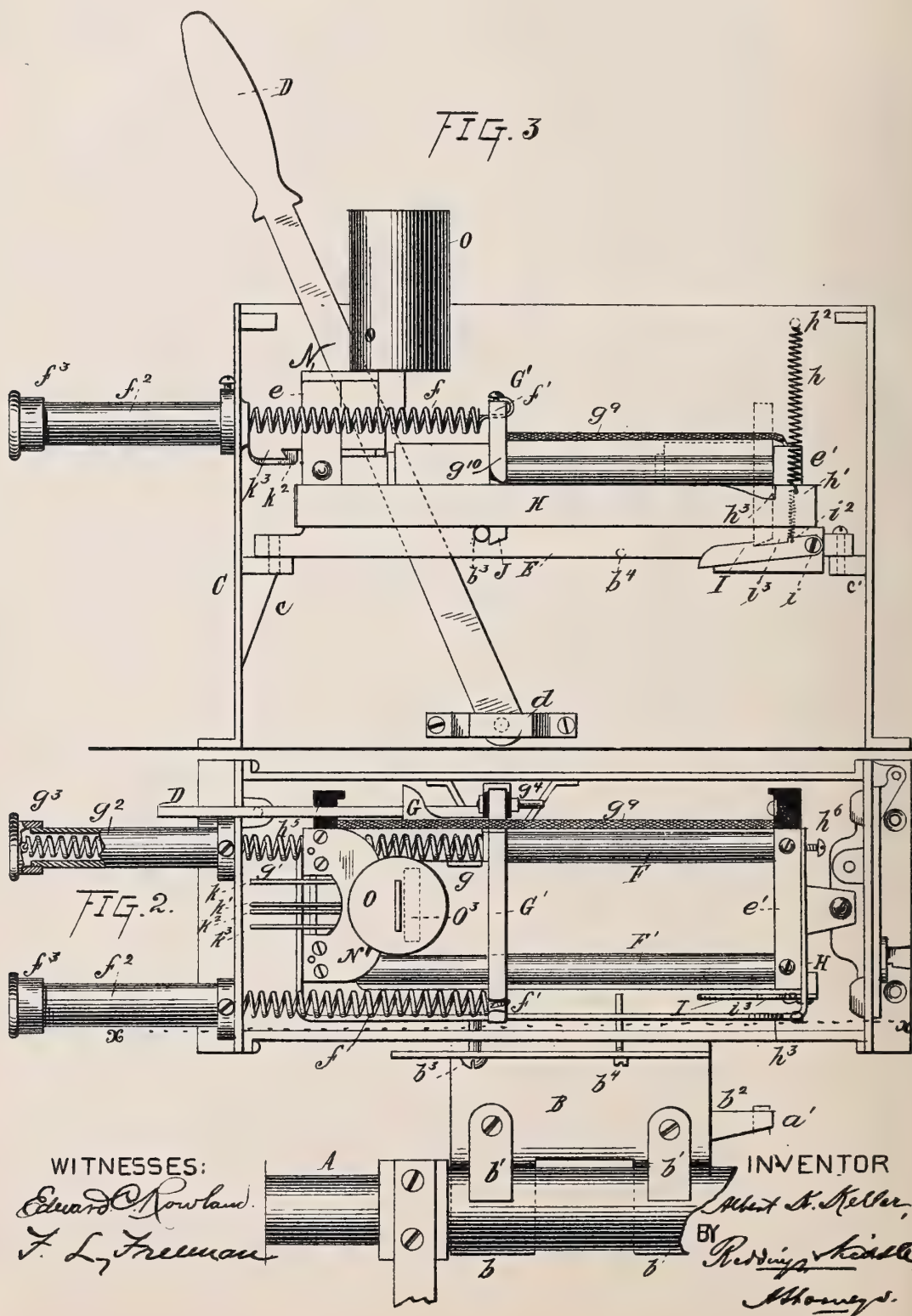
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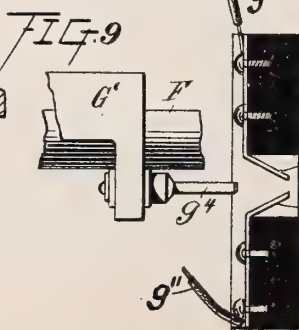
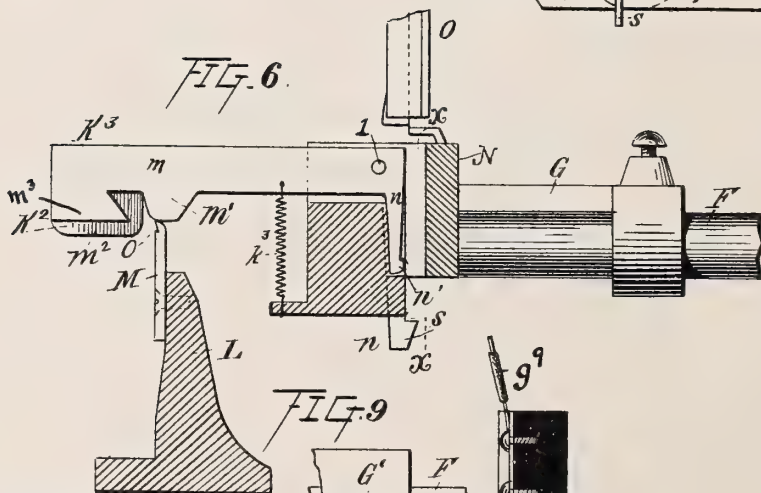
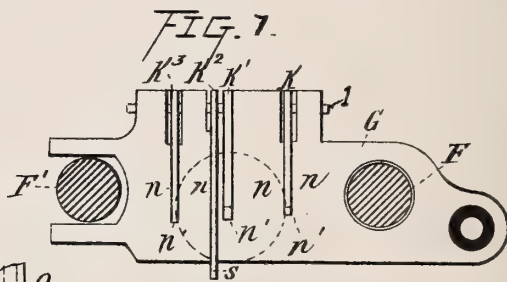
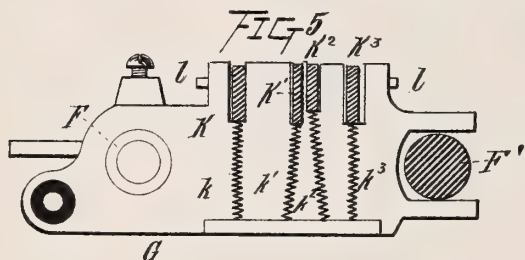
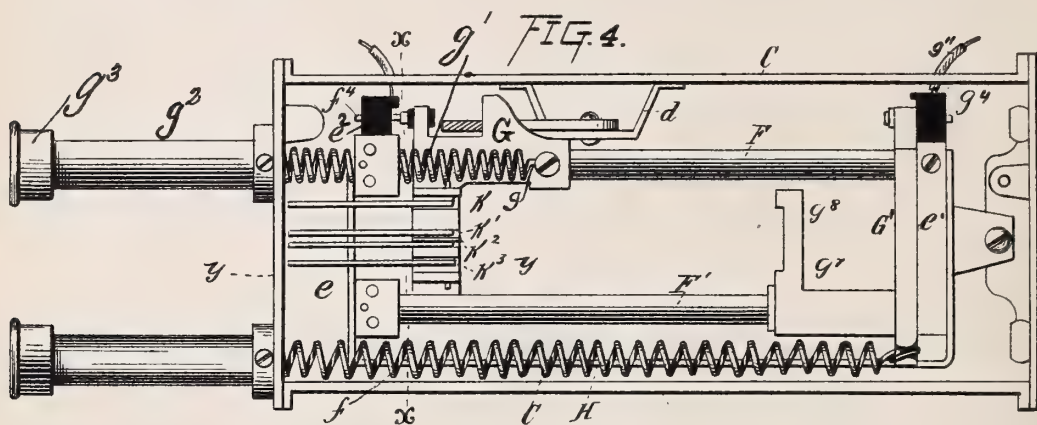


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(No Model.)

4 Sheets—Sheet 4.

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FIG. 10.

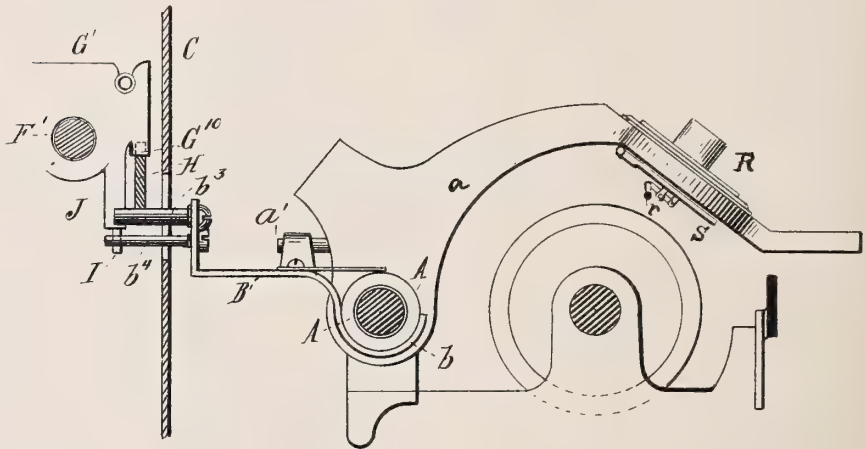


FIG 11

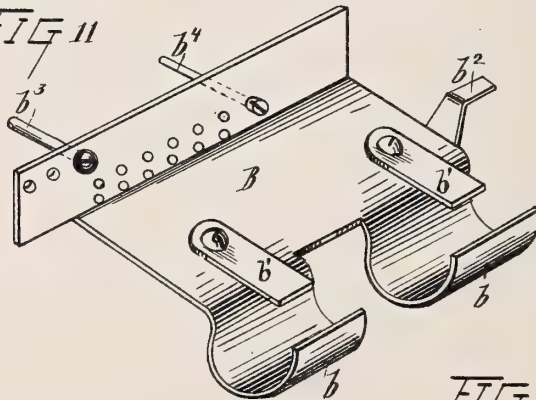
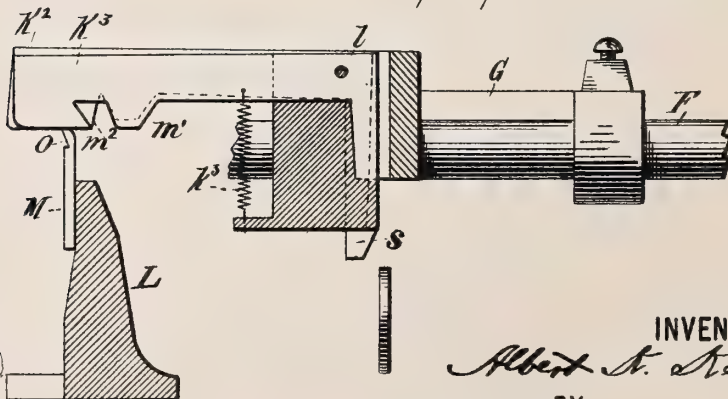


FIG. 8



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UNITED STATES PATENT OFFICE.

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ATTACHMENT FOR OPERATING PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 518,190, dated April 10, 1894.

Application filed January 31, 1891. Serial No. 379,824. (No model.)

To all whom it may concern:

Be it known that I, ALBERT K. KELLER, of New York city, in the county and State of New York, have made a certain new and useful invention relating to Attachments for Operating Phonographs, of which the following is a specification.

The object of my invention is to control the operation of phonographs, graphophones or other talking machines through the medium of a coin, after the manner of what are known as "vending machines," and my invention is particularly set forth and claimed hereinafter.

In the accompanying drawings, forming a part hereof, I have shown one form of mechanism embodying my invention, in which—

Figure 1 is a top plan view showing the phonograph inclosed in a case, with glass cover, connected with a machine or attachment embodying my invention, which also is inclosed in the same case, (and is indicated by dotted lines) and showing the preferred arrangements of the two machines with relation to each other. Fig. 2 is a top plan view of said attachment, showing the manner of its connection with the phonograph. Fig. 3 is a side view in elevation on line $x-x$ of Fig. 2. Fig. 4 is a top plan view showing the position of the parts of a portion of the attachment after the lever has been thrown over and returned, and the phonograph is talking. Fig. 5 is a sectional view of the locking levers taken through line $x-x$ of Fig. 4. Fig. 6 is a sectional side view of the locking mechanism taken through line $y-y$ of Fig. 4, and showing the position of the locking levers when the attachment is locked. Fig. 7 is an end view of the levers of the locking mechanism taken on line $x-x$ of Fig. 6. Fig. 8 is a sectional side view of the locking mechanism taken through line $y-y$ of Fig. 4, and similar to Fig. 6, but showing the position of the locking levers when the attachment is released. Fig. 9 is a detail view of one of the electrical contacts, which are on each end of the frame of the attachment and with which the plugs on the cross-heads or carriages of the attachment make connection to close the circuit to the battery and motor which operate the phonograph. Fig. 10 is a side view

taken on line $x-x$ of Fig. 1, showing the means of connecting the phonograph arm with the attachment, and showing the reproducer as raised off the phonogram, and held in that position by the attachment, as is the case when the phonograph arm is in its normal position, and the phonograph is at rest. Fig. 11 is a perspective view of the plate or means by which the phonograph arm is directly connected with the attachment.

The phonograph (see Fig. 1), erected upon a stand or placed in any convenient manner, is preferably operated by an electrically driven motor connected with an electric battery and may, if desired, be inclosed in a box or case, having a glass cover, as shown, to expose the phonograph to view, within which case is also placed, by preference, the attachment embodying my invention, the tube connected with the reproducer passing through an opening in the case to within reach of the listener. This case keeps the dirt and dust out of the phonograph and attachment, and is locked so as to prevent tampering with the machines. The construction shown in the extreme left hand of Fig. 1 is a top view of the governor and brake forming a portion of the driving mechanism, which forms no part of my invention.

As shown in Fig. 1, the attachment is preferably located behind the phonograph, and is directly connected with the sleeve A on the rod A' of the phonograph, over which rod this sleeve travels, and is free to move, the said sleeve carrying the phonograph arm a .

B. is an L shaped plate, (see Figs. 2 and 11) which on the edge of its horizontal portion has two downwardly curved tongues, b b , upon, or in which, the sleeve A rests, it being secured therein by two small plates b' b' , which are fastened to the said horizontal portion of the plate B, after tongues b b have been placed under the sleeve, in order that the plate B and sleeve A shall move together, as will be hereinafter explained. On the outer right hand side of this plate B there is a projection b^2 , which rests upon the projection a' on the rear of the phonograph arm, and lifts the reproducer when the plate B is lowered, and permits it to descend on the phonogram

when the plate B is raised. Through the vertical portion of the plate B are bored a number of holes, as shown, in two of which are inserted pins b^3 and b^4 , the functions of which will be hereinafter set forth.

C is a metal box having projections or supports $c\ c'$, on the inside, upon which rests the mechanism of the attachment.

D is a hand or shifting lever pivoted at its lower end at d , to the bottom of the box C.

E is a cast frame of metal which rests upon and is secured to the supports $c\ c'$, uniting it to the box C, and has, forming part of it, an upright $e\ e'$ on each end.

F F' are two guide rods that pass through the uprights $e\ e'$, across from the one to the other, and are firmly held therein.

G G' are two movable supports, carriages or cross-heads which travel on the guide rods F F', the cross-head G being behind or to the left of cross-head G', both of the cross-heads traveling on both guide rods F F', and being caused to move in one direction by the action of the lever D, and in the other direction by the action of the springs or weights or other suitable devices. Secured to the cross-head G at g is the spiral spring g' , and g^2 is a spring guide which incloses one end of this spring, there being screwed on to the outer end of this guide an adjustable cap g^3 , to which the spring is secured, to hold it in place within the guide, and for the purpose of shortening or lengthening it to increase or decrease its tension. A similar spiral spring f is secured at f' to the cross head G', and is also contained in a guide f^2 , the other end of this spring being attached to an adjustable cap f^3 screwed onto the guide f^2 , to shorten or lengthen the spring f , and thereby increase or decrease its tension in the same manner as with spring g' . The carriage or cross-head G' carries a metal contact plug or electrode g^4 (which is insulated, however, from the cross-head), so that when it is forced over by lever D, in the manner to be hereinafter set forth, it will pass between the contact points $g^5\ g^6$, (see Fig. 9) which are insulated from each other and from the support e' , to which they are attached, thereby closing the circuit at that point between the electric battery and motor (not shown), which operates the phonograph, which circuit will be hereinafter called the motor circuit. The cross-head G carries a similar metal contact plug or electrode f^4 (which is also insulated from this cross-head), which plug passes between the contact points or electrodes at e^2 on the upright e , similar to those on e' , which electrodes are also insulated from each other and from the upright e , closing the circuit at that point and thereby completing the motor circuit, and causing the phonogram to revolve, since the motor is directly connected with one of the contacts on the left hand side of the attachment, with which the plug f^4 makes contact to close the circuit at that point, and the opposite contact on the same side being connected with

one of the contact points, $g^5\ g^6$, by wire g^9 , the other of said contacts $g^5\ g^6$ being connected to the battery by the wire g^{11} . The cross-head G' is also cast with an inwardly extending arm g^7 , and an upright g^8 , having the inner side of the said upright g^8 cut away the exact size of the coin, which is intended to release the attachment.

H is a rocking bar having its ends bent at right angles and pivoted to the sides of the box C, or preferably to the uprights $e\ e'$, at $h^5\ h^6$, so that it can move up and down to raise and lower the phonograph arm. It is, however, prevented from falling by means of a spring h , which is connected with it at h' , and with the box C at h^2 , this bar H being prevented from moving or being carried up beyond the desired point by the spring h , by means of a lug or projection g^{10} , on the end of the cross-head G' (see Fig. 3) against which lug or projection the upper edge of the bar H bears. The outer or right hand end of the bar H, on its upper edge, is cut away at h^3 . Immediately below this cut away portion h^3 of the bar H is a pawl I, pivoted at i to the frame E, and to it is connected near its pivotal points a light spring i^2 , the tendency of this spring being to draw the pawl upward (the other end of this spring being secured to the upright e'). The upper edge or surface of this pawl I is notched or indented at i^3 , as shown in Fig. 3. The cross-head G' also has a lug or projection J, which extends downwardly below the lower edge of the bar H, or, as will be readily understood, this cross head may be cast of one piece with its side edge made straight, but mortised or recessed so as to form the projection g^{10} , against which the bar H rests, to prevent it from rising, as before stated, the lug or projection J also forming a part of this casting. The lower end of the lug or projection J is beveled, as shown, so that when it moves to the right it will easily depress the pawl I, by riding over the inner rounded end thereof, and be prevented from returning by the rising of the said pawl, whereby the indent i^3 therein will engage therewith and hold it. There are many other devices which may be employed for this purpose. The lever D passes up alongside the back of the box C, and moves lengthwise of the box through a slot in the top thereof, cut out for this purpose. It also passes along the side of the cross-head G, through a space made in the cross head (shown in Fig. 4).

Referring now to the pin b^3 , which, as before stated, passes through the plate B that connects the attachment to the phonograph—this pin b^3 projects through the plate and through a slot or opening in the side of the box C, so that the rocking bar H rests upon it; therefore when the bar H is down in its normal position, and prevented from rising by the lug g^{10} on the cross head G', that is, when the machine is at rest and in its normal position, it holds the phonograph arm, carrying the diaphragm with the recording point

thereon, *i. e.* the reproducer in a raised position and out of contact with the phonogram, and this is the preferred position of the phonograph arm and diaphragm when the machine is at rest, so as to prevent the needle or recording point on the diaphragm from resting upon the phonogram and marking and destroying the record registered upon it. When the bar H rises, the pin b^3 , plate B, and lug a' on the rear of the phonograph arm will rise with it, and the other end of the phonograph arm a will fall and lower the reproducer into its proper position on the phonogram, so as to enable the phonograph to talk when the phonogram is rotated, it being understood, of course, that the rise and fall of this phonograph arm has been previously determined and adjusted with reference to the phonogram, so that the movement of the rod H and plate B will be within the predetermined limits of the adjustment.

As will be seen by Fig. 11 the vertical portion of the plate B is somewhat longer than the body of the plate, and has several openings in it. The purpose of these openings or holes, through one of which, as shown, the pin b^3 passes, is to enable the attachment to be adjusted so that the phonograph will begin to talk as soon as the motor begins to run, that is, since the record on the phonogram may not begin at its extreme end, and in order that the listener may not have to wait for the arm to travel any distance to the point where the record begins before the talking commences, the pin b^3 is inserted into one of the openings or holes, according to the point or place where the record registered on the phonogram begins, for as is hereinafter explained, the plate B, and with it the phonograph arm, is carried to the left, that is from the end to the beginning of the record, by the engagement of the lug J with the pin b^3 . The other openings in this portion of the plate B, through one of which the pin b^4 is inserted, are for the purpose of regulating how much of the record registered upon the phonogram it is desired shall be heard, and since, as will be readily understood, this pin releases the pawl that holds cross-head G', if it is placed at only a short distance from the outer end of the plate B it will the sooner reach the pawl and release it, thereby stopping the machine by breaking the circuit at the contact points $g^5 g^6$.

I do not limit myself to the means shown and described for raising and lowering the phonograph arm, nor to the adjustable device shown and described for regulating how much of the record registered on the phonogram shall be heard, nor to the means shown and described operated by the phonograph itself for automatically breaking the motor circuit and raising the phonograph arm so as to enable the parts to be returned, since other devices which accomplish the desired results

can be employed for the purpose mentioned without departing from the spirit of my invention.

The locking mechanism which I preferably employ to lock the attachment, and which can only be released after the insertion into it of a coin, is shown in detail in Figs. 5, 6, 7 and 8, and consists of one or more elbow levers or triggers (four being shown in the drawings), $K K', K^2 K^3$. These levers are connected with the cross head G, and are pivoted at their elbows on a spindle or shaft l , the ends of which shaft bear in holes drilled in projections forming a part of the cross head G (see Fig. 5). The levers $K K' K^2 K^3$ are exactly alike, and the arms n on each one of them has a rounded lug or projection n' on its lower end. The arm n of the lever K^2 is a little longer than the arms of the other levers and terminates in the projection or stop s at the lower end, on which the coin that has been dropped into the machine falls. To each of the levers between the pivotal point and their outer ends is attached a spring k, k', k^2, k^3 , the tension of which is downward, the lower end of each of these springs being secured to the carriage or cross head G.

L is a support upon which rises or is screwed a plate or stop M, (or these could be cast in one piece,) with which the rear or outer ends of said levers are adapted to engage, and this stop has its upper edge notched on one side at o , and the other side made rounded, it extending under all of the levers $K K', K^2 K^3$, or some other form of fixed stop could be used. As will be seen by the drawings (Fig. 8), each of said levers has a projection m' formed on its under side, the lower edges of which are slightly rounded, and these projections rest upon the top of the stop M, Fig. 6 showing the position of the levers resting on the stop M, in the manner which they do when the machine is locked. The extreme outer ends m of the levers $K K', K^2 K^3$ are provided with projections m^3 on the left of the projections m' so that when the said levers fall or are drawn by the springs $k k', k^2, k^3$, and are drawn over to the right, the acute forward edges of the said projections m^3 will engage with the stop M and lock the cross-head G, which is thereby prevented from being moved. The lever K^2 also has a projection m^2 on its under side in the same position as the projections m^3 on the levers $K K'$ and K^3 , but this projection m^2 as shown in Fig. 6, is a little longer or wider than the projections m^3 on the other levers, and extends slightly below them and slightly in advance of them, and has both its inner and outer edges rounded. To the top of the upright e and over these levers, when the cross head G is in its normal position, is screwed or otherwise secured a plate N upon which rests the cylindrical receptacle O, into which the coin is first dropped, and through which it passes, and this receptacle is so placed that

the coin will pass through it, preferably in a straight line, so as to fall directly upon the stop or lug s on the bottom of the lever K^2 .

The operation of the machine is as follows:
 5 A coin, say a five cent nickel piece, is dropped into the slot in the cylindrical receptacle O , and will pass therethrough down in front of the levers $K\ K'\ K^2\ K^3$ and between them and the space cut out in the inward extension g^8
 10 of the cross head G' , and will fall directly upon the lug or projection s on the bottom of the lever K^2 , and will also come in contact with the lugs n' on levers K, K', K^3 . The lever D is then grasped by the hand and
 15 drawn to the right, and first strikes the cross-head G which, in turn, strikes cross-head G' , they being both carried in this manner by the lever D to the extreme right of the rods $F\ F'$. The coin that is interposed between the arm
 20 g^8 of the cross head G' and the levers $K\ K'\ K^2\ K^3$, if it be the proper coin, that is, of the requisite diameter and thickness, will nearly fill the space between the levers and the arm g^8 , permitting a very slight movement, if any,
 25 of the levers, independent of the movement of the cross head, and on moving the lever D , the lugs n' on the arm n of the levers $K\ K'\ K^3$ will press against this coin, and the outer ends of the levers $K\ K', K^3$ will ride over the
 30 stop M , that is, the inner arms of the levers $K\ K'\ K^3$ are prevented from moving upward by the interposed coin, but, on the contrary, are forced backward, thereby preventing the outer ends m of these levers, and the projec-
 35 tions m^3 thereon from falling and engaging the stop M , which would lock the attachment. At the same time the outer end of the lever K^2 , upon the inner end of which, on the lug or
 40 stop s thereof, the coin rests, will also ride over the stop M , the outer end m of the lever moving slightly upward as well as forward in riding over the said stop M . The
 45 inner end n thereof is thereby moved slightly backward, but sufficiently to drop or throw the coin into the money box, since the upright g^8 on the cross-head G' will have been moved
 50 away from it, as above stated. As will be readily seen, to unlock the attachment, all three of the levers $K\ K'\ K^3$ must be held in the position shown in Fig. 6, which is accom-
 55 plished by interposing the proper coin, as, if for any reason, one of them did not rise over the stop M , the attachment would be locked, that is, the coin must be a solid coin, for, even
 60 though it be of the requisite thickness and diameter, for if it had a hole in the center, like a washer, it would not trip one of the levers, since the lug on the bottom of the arm n of one of them would pass through the center
 65 hole thereof, and the arm n of that particular lever would, therefore, not be prevented from moving forward and upward, which would cause the projection m^3 on the outer end of that lever to drop behind the stop M .
 As will be noticed the arm of the lever K^2 upon which is the stop s , on which the coin

strikes, is placed on one side of the center, hence, if the coin inserted be of a too small diameter, even though it be solid, when it strikes upon the stop s on the lever K^2 , it will
 70 be thrown to the opposite side, and therefore would not come in contact with the outer lever on the other side, which lever would still lock the machine, for the reasons stated. Or,
 75 if the coin were too thin it would not prevent the projection m^3 on the outer ends of the levers $K\ K'\ K^3$ from dropping down and engaging the notch on the stop M and locking the machine, and this would result in such
 80 case by merely a slight movement of the lever D , that is when the levers are in the position shown in Fig. 6, and when no coin, or one that is too thin, is dropped in the machine,
 85 a slight movement of lever D , striking against the cross head G , will move these levers $K\ K'\ K^2\ K^3$ sufficiently to the right to cause the pro-
 90 jections m' on the under side of their outer ends m to slide down off the top of stop M (instead of riding over it) and the projections $m^2\ m^3$, by their own weight, and also by the ten-
 95 sion of the springs $k\ k'\ k^2\ k^3$, to drop down and strike against the stop M , thus locking the machine. But if a proper coin be inserted and rests on the lug s of the arm n of the lever K^2
 100 and the lever D be then moved, since, as before stated, the arms n of the levers $K\ K'\ K^3$ cannot therefore move to the right and up-
 105 ward, independent of the movement of the cross head G , the outer ends of these levers cannot drop, but the projections m^2 and m^3 thereon will slide or ride over the top of stop
 110 M , thereby releasing the attachment, and the lever K^2 carrying the coin will be tripped, and the coin emptied, (see Fig. 8,) into the money box (not shown), it taking only a slight
 115 movement of the lever K^2 to throw the money out of the machine and into the money-box, and this is so particularly when an improper coin is inserted, which will always be emp-
 120 tied from the machine. I do not, however, limit myself to the use with an attachment embodying my invention of a locking and re-
 125 leasing device of the specific construction shown and described, but any other suitable locking and releasing device may be em-
 130 ployed by me therewith without departing from the spirit of my invention, but the device shown and described efficiently accom-
 plishes the desired results. As, of course, will be readily understood, when the coin
 135 dropped into the machine is not of proper thickness, and the lever D is then moved in an attempt to release the locking mechanism so as to hear the phonograph, the lever will
 140 strike the cross head G which carries the levers $K\ K'\ K^2\ K^3$, and which will thereby be moved slightly to the right, causing the pro-
 145 jections m' on the outer ends of these levers, (which projections rest upon the stop M), to be also moved a little to the right, whereby the projections m' will slide off the upper
 150 rounded edge of stop M , being assisted in

so doing by the springs k k' k^3 , which draw them down, and the projections m^3 , will strike against the stop M and be held thereby, since the coin is not thick enough to fill to the desired extent the interstices or slots formed by the upright g^8 on the cross-head G' and the lugs n' on the arms n of the levers K K' K^3 , the arms n being thus left free to move upward and forward unimpeded a short distance, but sufficient to drop the outer ends of these levers, as just explained, and prevent them from riding over stop M. At the same time, the outer ends of the lever K^2 will also have fallen, since the projection m' on its under side will have slid off the stop M, but as the projection m^2 thereon is a little wider than the projection m^3 on the other levers, and extends a little below them, it will attempt to ride over the stop M, thereby raising arm m of the said lever K^2 and lowering or drawing back its other arm n , throwing the bad coin in the money box. The cross head G is released, however, by releasing the locking mechanism through the medium of a proper coin, as above set forth, thus permitting the lever D to force it together with cross head G' which is in advance of it, to the right until the projection J on the cross-head G' strikes the pawl I, upon or over which it rides, thereby depressing said pawl, which is again raised by the spring i^2 the indent i^3 in the pawl engaging the said projection. At the same time the plug g^4 on the cross-head G' is inserted between the contacts g^5 g^6 , closing the circuit at that point, the plug being held therein by the engagement of the pawl I on the projection J, which engagement also holds the cross-head G' against its return movement, as will be readily understood. The movement of the cross-head G' to the right expands spring f , thereby storing up power to return this cross-head G' when the projection J is released from the pawl I. As the cross-head G' moves along, the lug or projection g^{10} , forming part of it, rides on the upper edge of the bar H, and when it reaches the end of this bar H, where the same is cut away, the bar H will rise, being drawn up by the spring h , at the same time lowering the reproducer into a position for talking, since the pin b^3 on the plate B, as before explained, is in direct contact with the under side or edge of this bar H, which is pivoted at h^5 h^6 on the uprights of the attachment, that is, when this rocking bar moves up the pin b^3 , in the plate B, also moves up, and the reproducer on the phonograph arm is lowered. The phonograph does not yet begin to talk, for the motor which drives it has not commenced to run since the electric circuit from the battery to this motor is broken at the other side of the attachment, for the plug f^4 on the cross-head G has been withdrawn from the contacts at the starting point. The lever D is now returned to its original position, or the position which it had before the coin was inserted, being pushed by the

cross-head G , which is drawn back on the guide rods F F' by the spring g' attached to it, which has been expanded by the previous motion of the lever D, and the levers K K' K^2 K^3 traveling back with the cross head G will ride over the stop M and lock the machine again, and at the same time the plug f^4 , carried by this cross-head G will be inserted between the contacts in the upright on that side of the attachment, thereby closing the circuit at that point and completely closing the motor circuit, and starting the motor, which causes the phonograph arm to travel and the phonograph to talk. Thus it will be seen that the electric circuit is broken at two points, one on each side of the frame of the attachment, between which points the lever D travels, that when the attachment is in its normal position, the circuit is always broken at one point; that the motion of the lever D in one direction closes the circuit at one point, stores up power to break the circuit at that point at the proper time or when it is desired the phonograph shall cease to talk, and at the same time lowers the reproducer into position in relation to the phonogram for talking; and that by this movement of the lever D the circuit is broken at the starting point, the circuit at this point being, however, completed by the return movement of the lever to its original position, thereby completely closing the motor circuit and at the same time locking the attachment before the phonograph has begun to talk. As will be seen in the drawings, the pin b^4 is placed in advance of the pin b^3 , and this distance in advance is determined according to how much of the phonograph record it is desired shall be heard, the pin b^4 being also placed slightly below the pin b^3 , (see Fig. 11) and as the phonograph arm carrying the reproducer R moves along the phonogram and the machine continues to talk, it carries the plate B with it, and of course the pins b^3 b^4 , until the pin b^4 strikes the pawl I (see Figs. 2, 3 and 10) depressing or tripping it, thereby releasing the bar J and cross head G' , whereupon this cross-head is drawn back or returned to its original position by the spring f . By the return motion of the cross-head G' the plug g^4 is withdrawn from the contacts g^5 g^6 and the circuit is broken, shutting off the electric current and stopping the motor, and the phonograph ceases to talk. As will be understood when the cross-head G' returns, the projection or lug g^{10} thereon rides up over the indent h^3 in the outer end of bar H, which is thereby depressed, raising the reproducer off the phonogram, in the manner before explained, and this before the phonograph arm has commenced to return, so that in returning the needle or point r on the diaphragm S of the reproducer R will not cut or destroy the record registered upon the phonogram, and this raising of the phonogram arm is accomplished through the medium of the pin b^3 , which is attached to the phonograph plate B, and is in direct con-

tact with the bar H, all as before explained, at the same time cross-head G' being brought back by the spring *f* to its original position directly in advance of the cross-head G, as just stated. These operations occur in a very short period of time, almost simultaneously, and as soon as the phonograph arm has traveled to the end of the movement, or to any desired point of its forward movement, the pawl I is caused to be tripped by the pin *b*⁴, the cross-head G' is at once released and carried back by spring *f* to its original position; the phonograph arm is raised, the circuit broken, and the phonograph stops; but the phonograph arm must also be returned to its original position, and this is accomplished by means of the pin *b*³ of the plate B, which is struck by the rod J of the cross-head G', whereby the plate B and with it the phonograph arm is carried or forced back to its original position, and the machine is ready to be operated again by another coin, as set forth. The pin *b*⁴, which operates pawl I, can be so adjusted that with the movement of the phonograph arm, it shall release the pawl, break the electric circuit, lower the bar H, and raise the phonograph arm, as before explained. Thus it will be seen that this attachment will not operate except upon the insertion of the coin for which the machine has been adjusted, and although released after the proper coin has been inserted into it, the phonograph will not begin to talk until the lever has been moved and returned to its original position and the attachment locked again—ready for the insertion of another coin, thereby preventing a repetition of the reproduction without the payment or insertion into the machine of another coin.

From the foregoing it will also be seen that a coin controlled, or coin actuated machine or attachment for throwing a phonograph into operation, or for automatically operating a phonograph, embodying my invention, comprises the features which are specified in the following claims.

I believe that I am the first to conceive and produce the broad fundamental combinations between a phonograph, coin controlled mechanism, and mechanism to shift or raise or lower the reproducer which are necessary to the production of coin controlled phonographs. And I believe that I am the first to combine such coin controlled mechanism with a phonograph that is operated by an electric motor, and also the first to include the motor in a circuit that can be opened at two points in the operation of the coin controlled phonograph, and also the first to open and close such motor circuit at two points in the manner herein described.

In developing this broad invention I have made numerous specific inventions. In order to cover my invention completely, I have filed three applications, of which this is the generic application, and the other two specific applications. They are application se-

rially numbered 381,404, filed February 14, 1891, for improvements in machines for operating phonographs, and application serially numbered 384,477, filed March 10, 1891, for improvements in machines for operating phonographs.

While I have shown and described my invention as applied to phonographs as the mechanism to be thrown into operation by a machine embodying my invention, yet I do not limit my invention to its use with phonographs or talking machines, nor do I mean to limit my invention to the specific construction of a coin controlled machine or attachment for throwing phonographs into operation, embodying my invention, heretofore described and shown in drawings, nor to the particular construction of devices, separately or in combination, forming a part thereof, nor do I limit my invention to its use with phonographs *per se*, since I use the word phonograph throughout this specification, and the claims forming a part of it, as a generic term, and intend to include thereby all talking machines, such as the graphophone and the phonograph-graphophone, but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with a coin controlled phonograph, of means, released by the phonograph, to shift the reproducer, substantially as described.
2. The combination, with a phonograph, of a coin controlled mechanism for throwing it into operation, means for raising and lowering the reproducer, and means released by the phonograph to shift the reproducer, substantially as described.
3. The combination, with a phonograph, of a coin controlled mechanism for throwing it into operation, means operated by the phonograph to stop the phonograph, and means to shift the reproducer, substantially as described.
4. The combination, with a phonograph, of a coin controlled mechanism for throwing it into operation, means for raising and lowering the reproducer, and means operated by the phonograph to stop the phonograph, substantially as described.
5. The combination, with a phonograph, of a coin controlled mechanism for lowering the reproducer and throwing the phonograph into operation, and means operated by the phonograph to raise the reproducer and stop the phonograph, substantially as described.
6. The combination, with a phonograph, of a coin controlled mechanism for throwing it into operation, means operated by the phonograph to stop the phonograph, and means released by the phonograph to shift the reproducer, substantially as described.
7. The combination, with a phonograph, of a coin controlled mechanism, means for raising and lowering the reproducer, means for moving the reproducer along the phonogram, and means for shifting the reproducer, said

raising, lowering, moving and shifting means, all operating automatically in proper sequence upon each operation of the coin controlled mechanism, substantially as described.

5 8. The combination, with a phonograph, of a coin controlled mechanism for setting it into operation, and storing power to shift the reproducer, the said coin controlled mechanism being operated by hand, and means auto-
10 matically operated by the phonograph for releasing the power and shifting the reproducer, substantially as described.

9. The combination, with a phonograph, of a coin controlled mechanism, means for lowering the reproducer, and means for throwing the phonograph into operation, both of the two last named means operating in the order stated, upon each operation of the coin controlled mechanism, means for lifting the reproducer, and means for shifting the phonograph arm, substantially as described.

10. The combination with a phonograph, of a coin controlled mechanism, means for lowering the reproducer, means for moving the reproducer along the phonogram, both of said last named means operating in the order stated upon each operation of the coin controlled mechanism, means for lifting the reproducer, and means for shifting the reproducer, both of said means being thrown into operation by the phonograph, in the order stated, substantially as described.

11. The combination, with a coin controlled phonograph, of means for shifting the reproducer, and means operated by the shifting means for raising the reproducer, substantially as described.

12. The combination, with a phonograph, of a device for raising and lowering the reproducer, and coin controlled mechanism operating on said device to raise and lower it, and thereby lower and raise the reproducer, substantially as described.

13. The combination, with a phonograph, of a raising and lowering device connected with the reproducer, and means normally held locked, and adapted to be released by a coin to operate on said device to raise and lower it, and thereby lower and raise the reproducer, substantially as described.

14. The combination, with a phonograph, operated by a motor, of a coin controlled mechanism for starting and stopping the motor, and mechanism for raising and lowering the reproducer, substantially as described.

15. The combination, with a phonograph operated by a motor, of a circuit breaker in the motor circuit, opened by the reproducer at the end of the record, and means for closing the circuit at the said circuit breaker when the phonograph is to be operated, substantially as described.

16. The combination, with a phonograph, operated by a motor, and having its motor circuit normally open, of coin controlled mechanism for closing said circuit, and means

operated by the phonograph to open said circuit, substantially as described.

17. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of a coin controlled mechanism for closing the motor circuit, means operated by the phonograph to open said circuit, and means for raising and lowering the reproducer, substantially as described.

18. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of coin controlled mechanism for closing the circuit to operate the phonograph, means operated by the phonograph to open the circuit and stop the phonograph, and means for shifting the reproducer, substantially as described.

19. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of coin controlled mechanism for closing the circuit to operate the phonograph, means operated by the phonograph to open the circuit and stop the phonograph, means for shifting the reproducer, and means for raising and lowering the reproducer, substantially as described.

20. The combination, with a phonograph, operated by a motor and having its motor circuit normally open, of coin controlled mechanism to close the motor circuit, and lower the reproducer, substantially as described.

21. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of coin controlled mechanism to close the circuit and lower the reproducer, and means operated by the phonograph to open the circuit and raise the reproducer, substantially as described.

22. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of a coin controlled mechanism for closing the circuit, and throwing the phonograph into operation, means for raising and lowering the reproducer, means operated by the phonograph to open the circuit and stop the phonograph, substantially as described.

23. The combination, with a phonograph operated by a motor and having its motor circuit normally open, of means for lowering the reproducer, means for closing the motor circuit, both said means being coin controlled, means for opening the motor circuit, means for lifting the reproducer, and means for shifting the reproducer, substantially as described.

24. The combination, with a phonograph, operated by a motor, and having its motor circuit normally open, of coin controlled mechanism for closing said circuit, means for lowering the reproducer, and means operated by the phonograph to open said circuit and raise the reproducer, substantially as described.

25. The combination, with a phonograph operated by a motor and having its motor circuit normally open, of a coin controlled mechanism for closing said circuit, means for low-

ering the reproducer, means operated by the phonograph to open said circuit and raise the reproducer, and means to shift the reproducer, substantially as described.

5 26. The combination, with a phonograph operated by a motor and having its motor circuit normally open, of a device to hold the reproducer in a raised position, coin controlled mechanism to lower the reproducer
10 and close the motor circuit, and means operated by the reproducer to open the motor circuit and raise the reproducer, substantially as described.

27. The combination, with a phonograph
15 operated by a motor, of a coin controlled mechanism for starting and stopping the motor, a shifting lever, and an automatic lifting device for the reproducer of said phonograph, substantially as described.

20 28. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of a coin controlled mechanism, means operated by the coin controlled mechanism for closing the motor circuit,
25 means for raising and lowering the reproducer, means for moving the reproducer along the phonogram, means for opening the motor circuit, and means for shifting the reproducer, said raising, lowering, moving, shifting and circuit opening means all operating
30 automatically in proper sequence upon each operation of the coin controlled mechanism, substantially as described.

29. The combination, with a phonograph
35 operated by a motor, and having its motor circuit normally open, of a coin controlled mechanism, means for lowering the reproducer, and means for closing the motor circuit, both of the two last named means operating in the order stated, upon each operation of the coin controlled mechanism, means for lifting the reproducer, means for opening the motor circuit, and means for shifting the reproducer,
40 substantially as described.

30. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of a coin controlled mechanism, means for lowering the reproducer, means for closing the motor circuit, both of
50 said last named means operating in the order named upon each operation of the coin controlled mechanism, means for lifting the reproducer, means for opening the said motor circuit, and means for shifting the reproducer, all three of said means being thrown into operation by the phonograph, substantially as described.

31. The combination, with a phonograph operated by a motor, and having its motor
60 circuit normally open, of mechanism which is normally held locked, and is released by a coin, to throw the phonograph into position for operation, and means to relock said mechanism and close the motor circuit simultaneously, substantially as described.

32. The combination, with a phonograph operated by a motor and having its moto

circuit normally open, of mechanism which is normally held locked and is released by a coin, and means to lower the reproducer, lock
70 the said mechanism again and close the motor circuit before the phonograph has commenced to operate, substantially as described.

33. The combination, with a phonograph operated by a motor and having its motor
75 circuit normally open, of a device to hold the reproducer from contact with the phonogram, coin controlled mechanism to hold the phonograph locked, and means to close the motor circuit and lower the reproducer, substantially
80 as described.

34. The combination, with a phonograph operated by a motor and having its motor circuit normally open, of a device to hold the reproducer from contact with the phonogram,
85 coin controlled mechanism to hold the phonograph locked, means to close said motor circuit and lower the reproducer, and means to hold said motor circuit closed, which last named means are released by the phono-
90 graph to break said motor circuit, and means operated by the phonograph to stop the phonograph and to raise the reproducer at any desired point in the forward travel thereof, substantially as described.

35. The combination, with a phonograph operated by a motor, of an attachment which is normally held locked, and is released by a coin to lower the reproducer, and means to lock the attachment again and close the motor circuit before the phonograph begins to
100 operate, substantially as described.

36. The combination, with a phonograph operated by a motor and having its motor circuit normally open, of mechanism which
105 is normally held locked, and is released by a coin to throw the phonograph into position for operating, and means to relock said mechanism and close the motor circuit simultaneously, substantially as described.

37. The combination, with a phonograph operated by a motor, of an attachment which is normally held locked, and is released by a coin to lower the reproducer, means to lock the attachment again and close the motor circuit before the phonograph begins to operate,
115 and means operated by the phonograph to raise the reproducer and open the motor circuit, substantially as described.

38. The combination, with a phonograph
120 operated by a motor, of an attachment which is normally held locked, and is released by a coin to lower the reproducer, means to lock the attachment again and close the motor circuit before the phonograph begins to operate,
125 means to raise the reproducer and open the motor circuit, and means to shift the reproducer, substantially as described.

39. The combination, with a phonograph operated by a motor and having its motor
130 circuit normally open, of a mechanism which is normally held locked, and is released by a coin to throw the phonograph into position for operation, means to relock said mechan-

ism and close the motor circuit simultaneously, means operated by the phonograph for opening the motor circuit, means for lowering and raising the reproducer, and means for shifting the reproducer, substantially as described.

40. The combination, with a phonograph, of a motor for operating it, in a circuit which can be opened and closed at two points, an attachment which is normally held locked, and is released by a coin to open said motor circuit at one of the said points and close it at the other point, means to hold the circuit closed at the second point, means to throw the phonograph in position to operate, and means to simultaneously close the circuit at the first point and relock the attachment, substantially as described.

41. The combination, with a phonograph, of a motor for operating it in a circuit that can be opened and closed at two points, an attachment which is normally held locked, and is released by a coin to open said motor circuit at one of said points and close it at the other point, means to hold the circuit closed at the second point, means to simultaneously close the circuit at the first point and relock the attachment, and means operated by the phonograph to open the circuit at the second point, substantially as described.

42. The combination, with a phonograph, of a motor for operating it in a circuit which can be opened and closed at two points, an attachment which is normally held locked, and is released by a coin to open the circuit at one of said points and close it at the other point, means to hold the circuit closed at the second point, means to simultaneously close the circuit at the first point and relock the attachment, means operated by the phonograph to open the circuit at the second point, means for raising and lowering the reproducer, and means for shifting the reproducer, substantially as described.

43. The combination, with a phonograph, of means to hold the reproducer up, a motor in a circuit that can be opened and closed at two points for operating the phonograph, an attachment which is normally held locked, and is released by a coin to open said motor circuit at one of said points, and to close it at the other point, means to hold the circuit closed at the second point, means to lower the reproducer, and means to simultaneously close the circuit at the first point and lock the attachment, substantially as described.

44. The combination, with a phonograph, of means to hold the reproducer up, a motor in a circuit that can be opened or closed at two points for operating the phonograph, an attachment which is normally held locked and is released by a coin to open said motor circuit at one of said points and close it at the other point, means to hold the circuit closed at the second point, means to lower the reproducer, means to open the motor circuit at the second point, and means to lift the repro-

ducer off the phonogram, and means to shift the reproducer, substantially as described.

45. The combination, with a phonograph, of means to hold the reproducer up, a motor in a circuit that can be opened and closed at two points for operating the phonograph, an attachment which is normally held locked, and is released by a coin to open the motor circuit at one of said points and close it at the other point, means to hold the circuit closed at the second point, means to lower the reproducer on the phonogram, means to open the motor circuit at the second point, means to lift the reproducer, and means to shift the reproducer, said circuit opening, lifting and shifting means being operated by the phonograph, substantially as described.

46. The combination, with a phonograph, of a coin controlled mechanism for throwing it into operation, and adjustable means operated by the phonograph to stop the phonograph at any desired point, substantially as described.

47. The combination, with a phonograph operated by a motor and having its motor circuit normally open, of coin controlled mechanism for closing the circuit to operate said phonograph, and adjustable means operated by the phonograph to the open motor circuit and stop the phonograph at any desired point, substantially as described.

48. The combination, with a phonograph operated by a motor and having its motor circuit normally open, of coin controlled mechanism for closing said motor circuit, adjustable means operated by the phonograph to open said motor circuit and stop the phonograph at any desired point, and means also operated by the phonograph to raise the reproducer, substantially as described.

49. The combination, with a phonograph operated by a motor, of a rocking bar which engages with the arm thereof, of an attachment consisting of two cross-heads, each of which carries an electrode through which the motor circuit is completed, one of which cross-heads engages with the rocking bar to raise the reproducer off the phonograph, means released by a coin for effecting the movement of these cross heads so as to open the circuit at one point and close it at the other point, and to lower the reproducer, a catch in the path of the phonograph arm to hold one of the cross-heads in position, means for returning the other cross head to its original position, means for locking it there and simultaneously closing the motor circuit, and means for returning the first cross head to its original position, and thereby breaking the motor circuit, and lifting and shifting the reproducer when the said cross head is released by the phonograph, substantially as described.

50. The combination, with a phonograph, of a plate B having the tongues *b b*, plates *b' b'*, projection *b²*, and pin *b³*, and the rocking bar H, all arranged to operate substantially as, and for the purpose set forth.

51. The combination, with a phonograph, of

the plate B, having the tongues $b b$, plates $b' b'$, projection b^2 , and pins b^3 and b^4 , rocking bar H and spring pawl I, all arranged to operate substantially as and for the purpose set forth.

52. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of an attachment which consists of two cross-heads, each carrying a plug for making and breaking said motor circuit, a coin controlled locking and releasing device connected with one of said cross heads, and a device operated by said cross heads to lower the reproducer, substantially as described.

53. The combination, with a phonograph operated by a motor, of a coin controlled attachment which consists of two cross heads for operating said phonograph, each of which cross heads carries a projection or plug for making and breaking said motor circuit, means to lower the reproducer and move said cross heads from their normal position to break the motor circuit at one point and close it at another, a device to hold one of the cross heads and keep the circuit closed at that point, and a device to return the other cross head to complete the motor circuit and lock the attachment again before the phonograph can commence to operate, substantially as described.

54. The combination, with a phonograph, operated by a motor, of a coin controlled attachment, which consists of two cross-heads for operating the phonograph, each of which cross-heads carries a projection or plug for making and breaking the motor circuit, means to lower the reproducer, and move said cross heads from their normal position to break the motor circuit at one point and close it at another, a device to hold one of the cross-heads and keep the circuit closed at that point, a device to return the other cross-head to complete the motor circuit and lock the attachment again before the phonograph has commenced to operate, and means operated by the phonograph to break the circuit, raise the reproducer and shift the reproducer, substantially as described.

55. An attachment for operating phonographs, which consists of a frame or box to which are attached guide rods $F F'$, cross-heads $G G'$, which travel on said guide rods, springs connected with said box or frame and with said cross heads to return the cross heads, each of said cross heads carrying a projection or plug for making and breaking the motor circuit that operates the phonograph, a coin controlled locking and releasing device to release the cross heads, a rocking bar H, a spring pawl I, and a plate B, substantially as described.

56. An attachment for operating phonographs, which consists of a frame or box to which are attached guide rods $F F'$, cross heads $G G'$, which travel on said guide rods, springs connected with said box or frame and with the said cross-heads to return the cross

heads, each of said cross-heads carrying a projection or plug for making and breaking the motor circuit that operates the phonograph, a coin controlled locking and releasing device to release the cross heads, a rocking bar H, a spring pawl I, a projection on the cross-head G' to prevent the bar H from rising, a projection J, on said cross head G' which engages the pawl I and holds the cross head G' at that point, a plate B connected with a sleeve A of the phonograph, one end of which plate is in contact with the phonograph arm a , an adjustable pin b^3 , upon which the rocking bar H rests, and an adjustable pin b^4 to trip the pawl I at any desired point on the travel of the phonograph arm, substantially as and for the purpose set forth.

57. An attachment for operating phonographs, which remains normally locked and is released by a coin, consisting of two cross-heads, each carrying a projection or plug for making and breaking the motor circuit that operates the phonograph, a lever to carry or force both the cross-heads or carriages in the same direction, to break the said motor circuit at one point and close it at the other point, a spring pawl for holding the circuit closed at the last named point, means to return the lever and lock the attachment again, and at the same time, close the motor circuit at the first point, and thereby complete the motor circuit before the phonograph begins to operate, and a device for raising and lowering the reproducer operated by the phonograph through one of the cross-heads, substantially as described.

58. An attachment for operating phonographs, which normally remains locked, and is released by a coin, consisting of two cross heads, each carrying a projection or plug for making and breaking the motor circuit that operates the phonograph, a device to carry or force both the cross-heads in the same direction to break the motor circuit at one point and close it at the other point, and mechanism to hold the circuit closed, but which is released by the phonograph to break the motor circuit, raise the reproducer and shift said reproducer to its starting point at any desired point in the travel of the phonograph arm, substantially as described.

59. An attachment for operating phonographs, which remains normally locked, and is released by a coin, consisting of two cross heads, each carrying a projection or plug for making and breaking the motor circuit that operates the phonograph, a lever to carry or force both the cross-heads in the same direction to break the electric circuit at one point and close it at another, mechanism to hold the circuit closed, but which is released by the phonograph to break the motor circuit, raise the reproducer, and shift the reproducer to its starting point at any desired point on the travel of the reproducer, a locking and releasing device which consists of one or more levers, and a fixed stop with which one of the

free ends of said levers engages to lock the attachment, substantially as described.

60. An attachment for operating phonographs, which remains normally locked and is released by a coin, consisting of two cross-heads, each carrying a projection or plug for making or breaking the motor circuit that operates the phonograph, a lever to carry both the cross-heads in the same direction to break the motor circuit at one point and to close it at another, mechanism to hold the circuit closed, the said mechanism being released by the phonograph to break the motor circuit and raise the reproducer, and means to shift the reproducer, substantially as described.

61. An attachment for operating phonographs which remains normally locked and is released by a coin, consisting of two cross heads, each carrying a projection or plug for making or breaking the motor circuit that operates the phonograph, a lever to carry both the cross heads in the same direction to break the motor circuit at one point and close it at another, mechanism to hold the circuit closed, the said mechanism being released by the phonograph to break the motor circuit and raise the reproducer, and springs connected with the cross-heads, which springs are expanded by the traveling of said cross-heads away from the starting point to return said cross-heads and reproducer, substantially as described.

62. The combination with a phonograph operated by a motor having its motor circuit normally open, of a device to hold the phonograph arm in a raised position, a coin controlled attachment operating on said device to lower the phonograph arm, means to close the circuit and lock the attachment before the phonograph commences to operate, mechanism to hold the circuit closed, and adjustable means operated by the phonograph to release said mechanism, break the motor circuit and raise the reproducer, substantially as described.

63. An attachment for operating phonographs, which normally remains locked, and is released by a coin, consisting of a frame or box to which are attached two guide rods, two cross-heads G G' , which travel on said guide rods, each of said cross heads carrying a projection or plug for making and breaking the motor circuit, said circuit being normally broken at one point, and the plug on the cross head G normally closing the circuit at another point before the attachment is released, springs f , g' , attached to the said frame and cross heads to return the cross heads, a projection J and lug g^{10} on said cross head G' , a spring pawl I , a rocking bar H , upon which the lug g^{10} rests and slides, a detent at one end of the rocking bar H , a spring h , connected with the rocking bar H at that point, a lever to break the motor circuit at one point and move the cross head G' and close the circuit at another point, all arranged to operate substantially as shown and described.

64. In a coin operated phonograph, the combination with a coin operated trigger, and with a cross head, carrying a plug which is released by said trigger, and with an electrode for engagement with said plug, of a carrying arm for the reproducer, and means whereby the carrying arm will break the circuit at the end of the movement, substantially as described.

65. In a coin operated phonograph, the combination with a trigger, tripped by a coin, of a lever which is released by said trigger, and two electrodes, one of which is connected to said lever and moved by it into contact with the other electrode, substantially as described.

66. The combination, with a phonograph operated by a motor, of a coin controlled attachment for operating said phonograph, which attachment consists of two cross-heads, each carrying a projection or plug for making and breaking the motor circuit, means to lower the reproducer and move said cross heads to break said circuit at one point and close it at another, a device to hold one of the cross heads, and keep the circuit closed at that point, a device to return the other cross head to complete the motor circuit, and lock the attachment again before the phonograph has commenced to operate, and means operated by the phonograph to break the circuit and raise the reproducer, substantially as described.

67. The combination, with a phonograph, adapted to be operated by a motor, in a circuit which is normally open, and can be made and broken at two points, of two movable cross heads or carriages, each carrying a circuit making and breaking device to open and close said motor circuit, a shifting lever to move said cross heads, and a locking mechanism actuated by a coin to release said cross heads, substantially as described.

68. The combination, with a phonograph operated by a motor, in a circuit which is normally open, and can be made and broken at two points, of two movable cross heads or carriages, each carrying a circuit making and breaking device to open and close said motor circuit, a device operated by one of said cross heads to raise and lower the phonograph arm, locking mechanism actuated by a coin to release said cross heads, and a shifting lever to move said cross heads, substantially as and for the purpose set forth.

69. The combination, with a phonograph, operated by a motor, in a circuit which is normally open, and can be made and broken at two points, of two movable cross heads or carriages, each carrying a circuit making and breaking device to open and close said motor circuit, a device operated by one of said cross heads to raise and lower the phonograph arm, a shifting lever to move said cross heads, and locking mechanism actuated by a coin to release said cross heads, the locking mechanism consisting of one or more levers carried by one of said cross heads, and a fixed stop with

which said lever or levers engage to lock said cross heads, substantially as and for the purpose set forth.

70. The combination, with a phonograph, having its motor circuit normally open, of an attachment for operating said phonograph which is normally locked but is released by a coin, said attachment being connected with the phonograph in such manner as to hold the reproducer from contact with the phonogram when the phonograph is not operating, a lever to lower the reproducer to the phonogram, two movable electrodes moved by said lever to alternately open and close the motor circuit by the forward and backward movement of said lever, and mechanism to hold the circuit closed, but released by the phonograph to break the motor circuit and raise the reproducer at any desired point in the travel of said reproducer, substantially as described.

71. The combination, with a phonograph having its motor circuit normally open, of an attachment for operating said phonograph which remains normally locked, but is released by a coin, said attachment being connected with the phonograph in such manner as to hold the reproducer from contact with the phonogram when the phonograph is not operating, a lever, by the movement of which in one direction the reproducer is lowered to the phonogram, and the motor circuit closed at one point and is opened at another, and by the return movement of which the attachment is locked again before the phonograph begins to operate and the motor circuit closed at another point, thereby completing the motor circuit, and mechanism to hold the circuit closed released by the phonograph to break said circuit and raise the reproducer at any desired point in the travel of said reproducer, and a device to return said reproducer, substantially as described.

72. The combination, with a phonograph, having its motor circuit normally open, of an attachment for operating said phonograph which remains normally locked but is released by a coin, said attachment being connected with the phonograph in such manner as to hold the reproducer from contact with the phonogram when the phonograph is not operating, a lever, by the movement of which in one direction, the reproducer is lowered to the phonogram and the motor circuit closed at one point and opened at another, and by the return movement of which the attachment is locked again before the phonograph begins to operate, and the motor circuit closed at another point, thereby completing the motor circuit, a locking and releasing device to hold the attachment locked, operated by a coin to release the attachment, and mechanism to hold the motor circuit closed, released by the phonograph to break the motor circuit and raise the reproducer at any desired point in the travel of the reproducer, substantially as described.

73. The combination, with a phonograph

having its motor circuit normally open, of an attachment for operating said phonograph which remains normally locked, said attachment being connected with the phonograph in such manner as to hold the reproducer from contact with the phonogram when the phonograph is not operating, a lever, forming a part of said attachment, by the movement of which in one direction the reproducer is lowered to the phonogram and the motor circuit closed, and means to hold the attachment locked, the said means being released by a coin, substantially as described.

74. The combination, with a phonograph, having its motor circuit normally open, of an attachment for operating said phonograph, which remains normally locked but is released by a coin, said attachment being connected with the phonograph in such manner as to hold the reproducer from contact with the phonogram when the phonograph is not operating, a lever, forming part of said attachment, by the movement of which in one direction the reproducer is lowered to the phonogram and the motor circuit closed, and mechanism to hold the circuit closed at that point, but released by the phonograph to break said circuit and raise the reproducer at any desired point in the travel of reproducer, substantially as described.

75. The combination, with a phonograph having its motor circuit normally open, of an attachment for operating said phonograph which remains normally locked, but is released by a coin, said attachment being connected to the phonograph in such manner as to hold the reproducer from contact with the phonogram when the phonograph is not operating, a device to hold the attachment locked, actuated by a coin to release the attachment, a lever, by the movement of which in one direction from its starting point the motor circuit is broken at one point and closed at another and the reproducer lowered to the phonogram, a device to return the lever to its starting point to complete the motor circuit and lock the attachment again before the phonograph commences to operate, and mechanism, to hold the circuit closed, which is released by the phonograph to break the motor circuit and raise the reproducer from contact with the phonogram at any desired point in the travel of said reproducer, substantially as described.

76. The combination, with a phonograph having its motor circuit normally open, of an attachment for operating said phonograph which remains normally locked, but is released by a coin, said attachment being connected to the phonograph in such manner as to hold the reproducer from contact with the phonogram when the phonograph is not operating, a device to hold the attachment locked, the said attachment being operated by said coin to release the attachment, a lever, by the movement of which in one direction from the starting point the motor circuit

is broken at one point and closed at another and the reproducer lowered to the phonogram, a device to return said lever to its starting point to complete the motor circuit and lock the attachment again before the phonograph commences to operate, mechanism, to hold the circuit closed, which is released by the phonograph arm to break the motor circuit and raise the reproducer at any desired point in the travel of said reproducer, and a device to shift the reproducer, substantially as described.

77. The combination, with a phonograph having its motor circuit normally open, of an attachment for operating said phonograph which remains normally locked, and is released by a coin, a device to raise and lower the reproducer, a lever, by the movement of which in one direction the reproducer is lowered to the phonogram and said motor circuit broken at one point and closed at another, a device to return the lever to its starting point to complete the motor circuit and lock the attachment again before the phonograph commences to operate, and mechanism, to hold the circuit closed, which is released by the phonograph to break the motor circuit

and raise the reproducer from contact with the phonogram at any desired point in the travel of said reproducer, substantially as described.

78. The combination of locking levers K K' K^2 K^3 constructed as shown and described, springs k k' k^2 k^3 connected therewith, fixed stop M , cross heads G G' , and arm g^3 on said cross head G' , and lever D all arranged to operate after the insertion of a coin, substantially as and for the purpose set forth.

79. The combination, with the phonograph arm of a phonograph, of rocking bar H , locking levers K K' K^2 K^3 , constructed as shown and described, springs k k' , k^2 k^3 connected therewith, fixed stop M , cross heads G G' and arm g^3 on said cross head G' and lever D , all arranged to operate after the insertion of a coin, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification the 28th day of January, A. D. 1891.

ALBERT K. KELLER.

In presence of—

HENRY C. SMITH,
IDA E. GILLILAND.

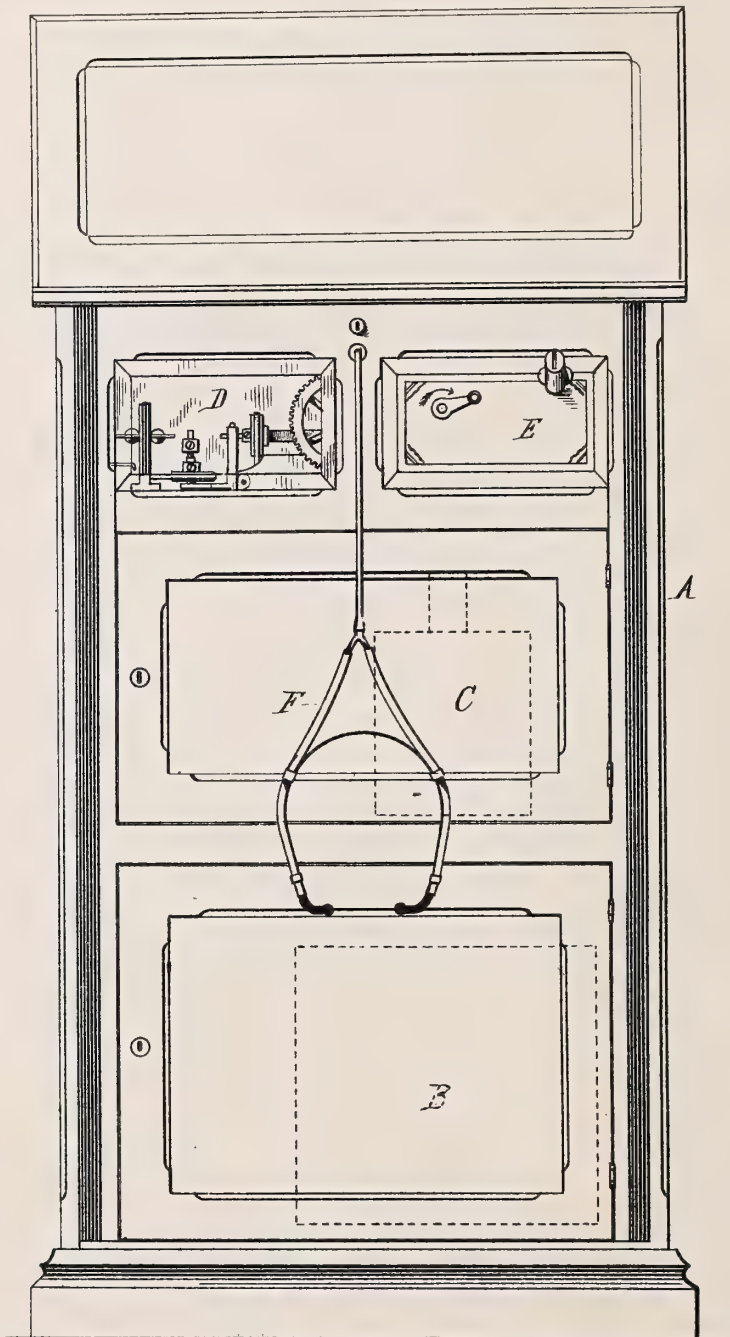
(No Model.)

4 Sheets—Sheet 1.

A. K. KELLER.
MACHINE FOR OPERATING PHONOGRAPHS.

No. 518,191.

Patented Apr. 10, 1894.



WITNESSES:

Edward C. Rowland
Louis F. Goldmann.

Fig. 1.

INVENTOR

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BY

Robert H. Kiddle

ATTORNEYS

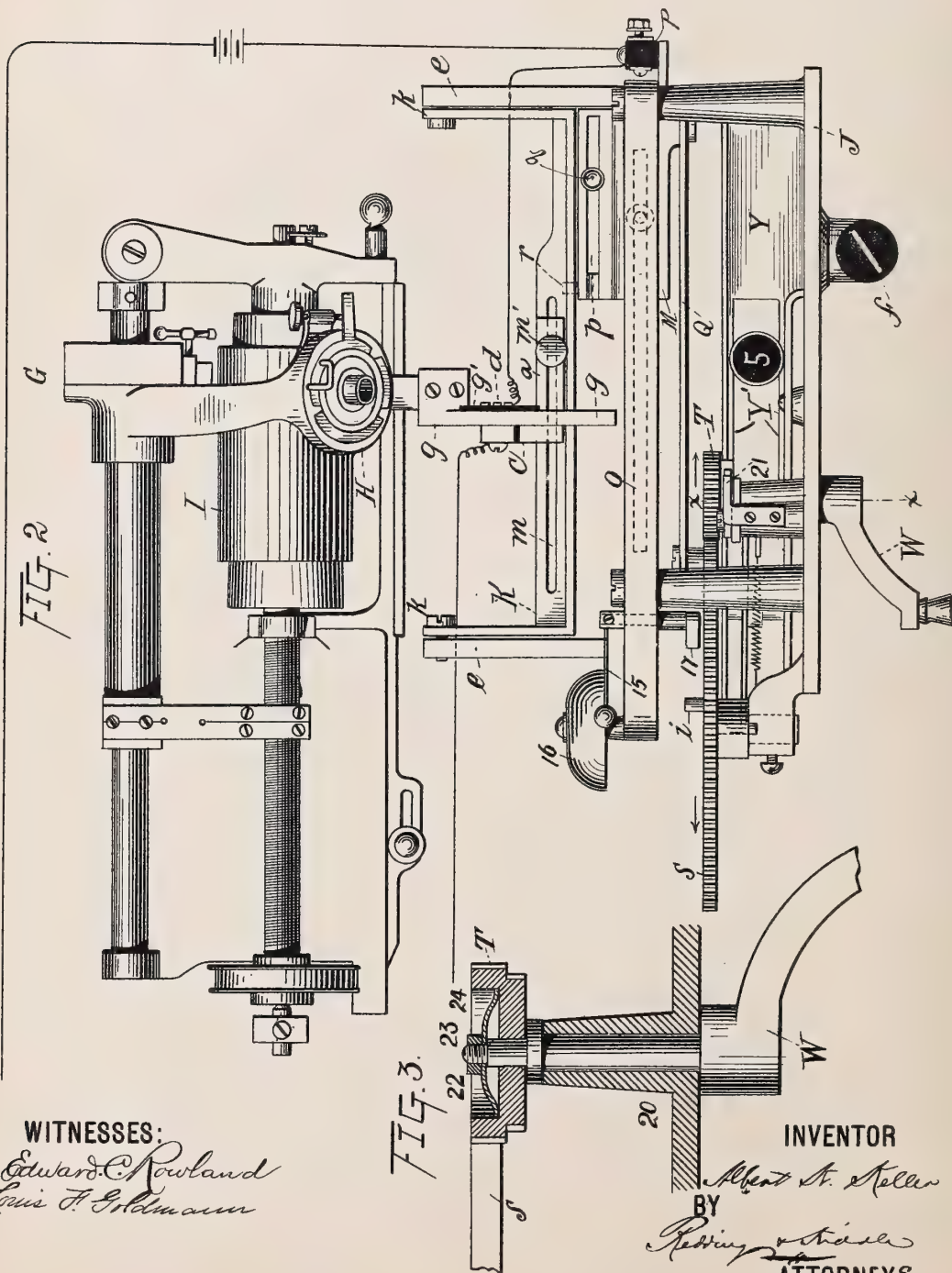
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4 Sheets—Sheet 2.

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(No Model.)

4 Sheets—Sheet 3.

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No. 518,191.

Patented Apr. 10, 1894.

FIG. 4.

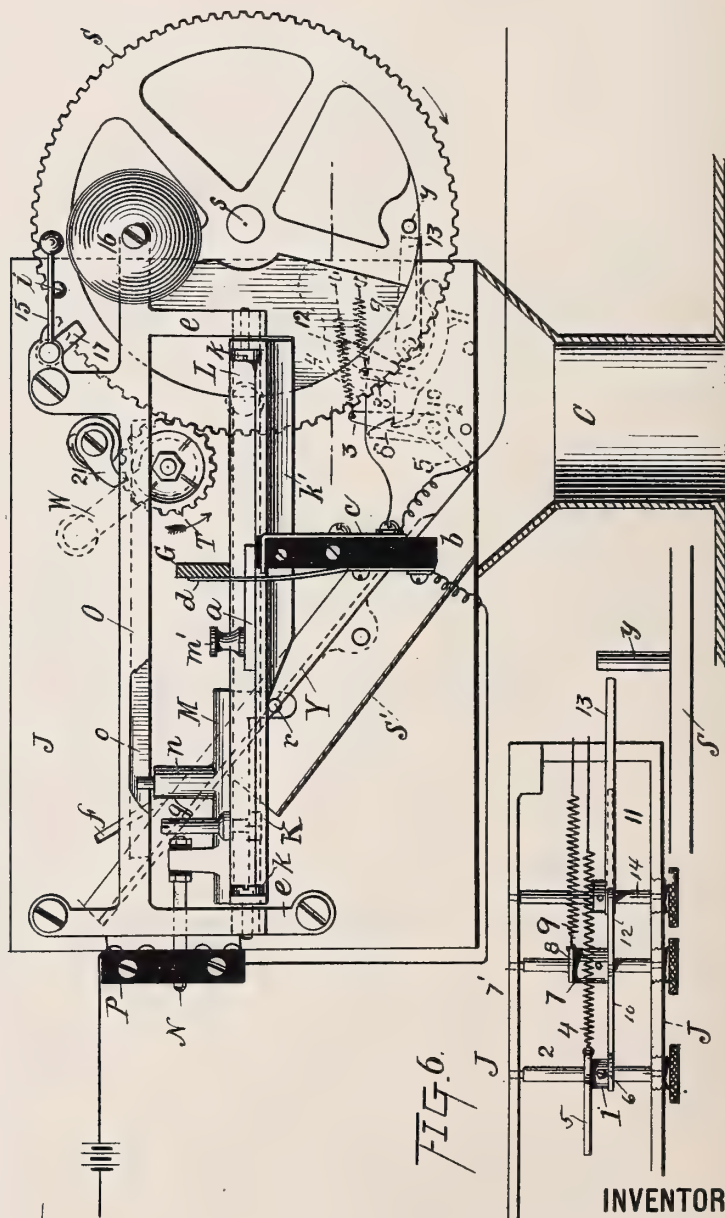
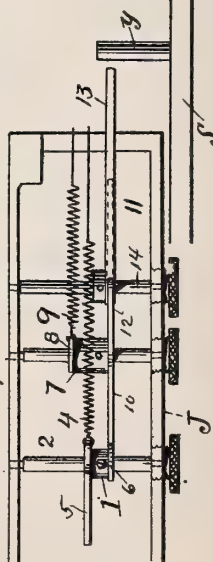


FIG. 6.



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(No Model.)

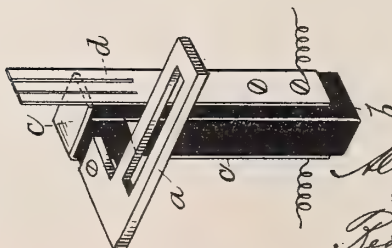
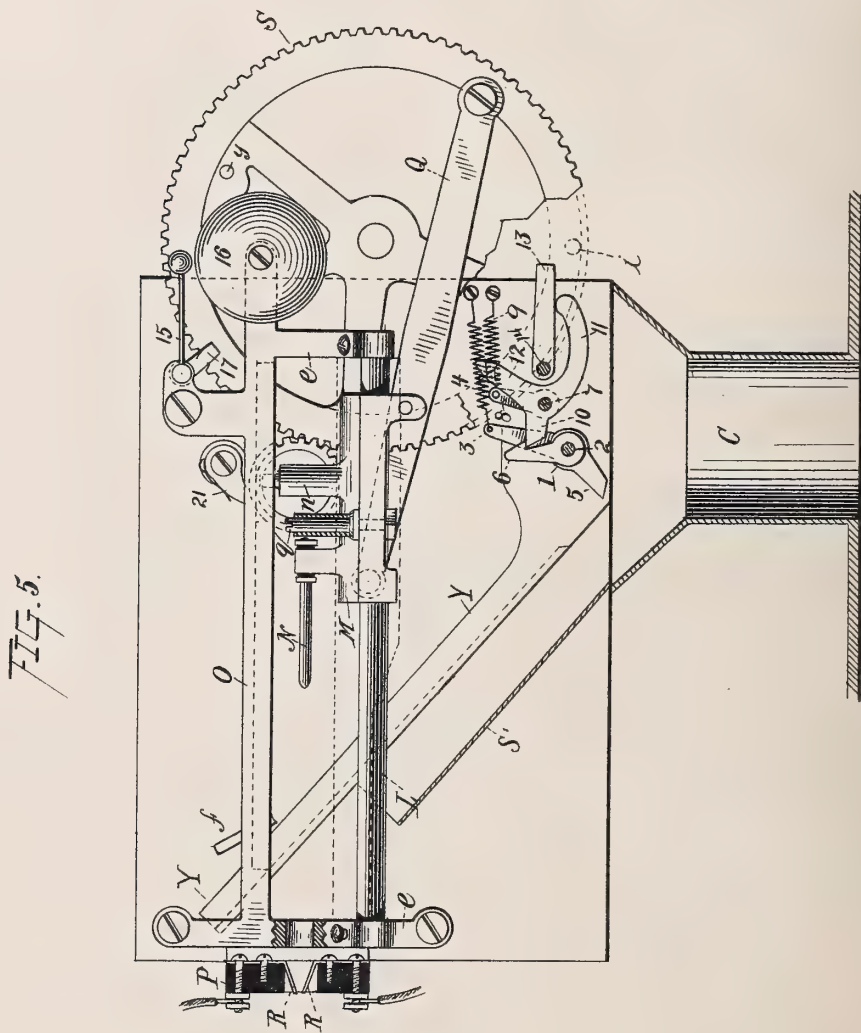
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A. K. KELLER.

MACHINE FOR OPERATING PHONOGRAPHS.

No. 518,191.

Patented Apr. 10, 1894.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ALBERT K. KELLER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AUTOMATIC PHONOGRAPH EXHIBITION COMPANY OF NEW YORK.

MACHINE FOR OPERATING PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 518,191, dated April 10, 1894.

Application filed February 14, 1891. Serial No. 381,404. (No model.)

To all whom it may concern:

Be it known that I, ALBERT K. KELLER, of New York city, in the county and State of New York, have invented certain new and useful Improvements in Machines for Operating Phonographs, of which the following is a specification.

My invention relates to machines or attachments for operating phonographs after the manner of what are known as "vending machines," such attachments remaining normally locked but being released by a coin to be moved to operate the phonograph, and my invention consists of the novel devices and combination of parts hereinafter described and set forth in the claims hereof.

In the accompanying drawings, forming a part hereof, I have shown a machine which embodies my invention, in which—

Figure 1 is a front view in elevation of the case A, which incloses the electric battery B, coin receptacle C, phonograph D and attachment E, which are by preference arranged in relation to each other in different compartments, as shown, the listening tube F connected with the phonograph passing through an opening in the front of the case. Fig. 2 is a top or plan view of a phonograph and of an attachment embodying my invention connected therewith. Fig. 3 is a sectional view taken through line $x-x$ of Fig. 2, showing the crank and connections therewith. Fig. 4 is a side view in elevation, looking from the rear of the attachment, and showing the normal position of the parts of the attachment. Fig. 5 is a view similar to Fig. 4, but with the rocking bar K and parts attached thereto removed, showing the position of certain parts of the attachment, after a coin dropped into the machine has tripped the locking mechanism, and the parts have been moved from their normal position. Fig. 6 is a top or plan view of the locking mechanism; and Fig. 7 is a perspective view of the adjustable circuit opening and closing device.

As shown in Fig. 2 the phonograph is located in front of the attachment, the driving mechanism which I preferably employ for operating it consisting of an electric battery and motor (not shown) as is now usual, and G is the phonograph arm and H the reproducer

and recorder carried thereby. When the phonograph is at rest and in its normal position with respect to an attachment embodying my invention, the phonograph arm G is normally down and at the end of its forward movement, that is to say, at the end of the record on the phonogram I, or at some desired point thereof, away from the commencement of the record thereon, and to the said arm G is connected an extension g , which has insulating material g' on one side thereof.

J is a metal plate to which is secured the frame supports and bearings for the parts and devices comprising the attachment proper.

K is a rocking bar or reciprocating raising and lowering device, which is pivoted at k , k on the arms e , e of the frame, and upon this rocking bar K the phonograph arm G, or its extension g rests. The rocking bar K has a rib k' on its under side, which is cut away at one end thereof, as shown in Fig. 4; and in the upper surface of said rocking bar is cut a slot or guide-way m , which together with the clamping screw m' permits the circuit making and breaking device, shown in Fig. 7 to be secured to the rocking bar at any desired point. The circuit making and breaking device referred to consists of a metal piece a , to which is united a block of insulating material b , while to one side of the said block b is connected a metal strip c , which is bent over across the top of the said block and extends slightly beyond it, as shown. To this metal strip runs a wire connecting with the battery and motor and forming a part of the motor circuit. To the other side of the said block of insulating material is secured a metal forked strip or spring contact d , to which runs a wire connecting with the battery and motor, and the motor circuit is thus adapted to be closed when the strips c and d make contact, but these strips are normally kept apart by the phonograph arm G, or extension thereof, which when at rest, is against the strip d , which extends up beyond the insulating block b , as shown in Fig. 4. Thus when the arm G is moved away, or shifted, the spring contact d will return itself into contact with the metal strip c , thereby closing the motor circuit at that point. As before stated, this circuit making and breaking de-

vice is carried by the rocking bar K, and is secured thereto by means of the before mentioned screw m' , which passes through the metal piece a of the circuit maker, which rests on the rocking bar, and through the slot or guide-way m in the said bar, thus permitting the circuit making and breaking device to be adjusted and secured at any point on the said rocking bar, according to how much of the record on the phonogram it is desired shall be heard, since it is adapted to be operated by the phonograph arm in its forward travel to break the motor circuit, and thereby stop the phonograph.

L is a guide rod which is supported in the supports e, e of the frame, and upon this guide-rod travels a cross head M or movable operating device from which rises a guide post n , the upper end of which slides, in order to guide the cross head, in a groove or guide o in the cross piece O of the frame which supports the attachment. In the upper surface of the cross head M is a slot or guide-way p , in which may be secured at any point thereof a post q , by means of which the phonograph arm is moved by the said cross head to shift it from one end of the record to the other; to the under side of the cross head M is secured a pin r on which rests the rocking bar K (see Fig. 4) and the said cross head also carries a projection or plug N, which is insulated therefrom, and which is adapted to make contact with the metal contacts or electrodes R, R, carried by a block of insulation P on one side of the attachment, to close the motor circuit at that point, and to which contacts are attached the wires connecting with the battery and motor.

As before stated, Fig. 4 shows the position of all the parts when the phonograph is at rest and the attachment locked, that is, the plug or electrode N is in contact with the contacts R, R, and the motor circuit is hence closed at that point, but the strips or contacts c and d supported by the rocking bar K are separated, being kept apart by the phonograph arm G or extension thereof, and hence the motor circuit is open at that point, that is, said motor circuit is normally open.

S is a cog wheel or as I may hereinafter term it, a driving wheel which turns on the shafts and in gear with a smaller cog wheel T, which for clearness I may hereinafter term a "primary" wheel, the said cog wheel S being adapted to be moved by the small cog wheel T, which is connected with the crank W, and the cog wheel S is connected with the cross head M by a connecting rod Q, and is of such size or diameter that one revolution thereof will move the cross head M from its normal position, along the guide rod L, to the extreme end thereof, and return the cross head again to its normal position, the said wheel S being held locked, thus locking all the parts of the attachments, until it is released in the manner to be hereinafter explained.

Y is a coin chute, through which the de-

sired coin travels, the coin being inserted therein through the opening f for that purpose in the plate J, and dropping through the said chute into the coin receptacle or money box C. This chute is constructed, as shown in Figs. 2 and 4, that is, it is cut or slotted out on its under side, so as to leave a strip or guide Y' on each side thereof, sufficient to support a coin of the proper size, and prevent it from falling therethrough without releasing the locking mechanism but the slot is large enough to permit a smaller coin to drop or to be directed therethrough into another chute, S' on the under side of the chute Y, which chute S' also leads to the coin receptacle. Hence if a coin not of the proper size be dropped into the machine in an attempt to operate it, said coin will not trip the locking mechanism, but will be dropped into the chute S' and thence into the money box.

The locking mechanism proper consists of the following:

1 is a metal sleeve which is keyed to a shaft 2, supported in bearings in the metal plate J, and this sleeve has connected with it an arm 3, to which is attached one end of a spring 4, the other end of said spring being attached to the frame of the attachment. To another part of said sleeve is connected an arm 5 and a hooked or toothed arm 6, and upon the arm 5 the coin drops or strikes, tripping it as it passes through the chute Y, the said arm 5 protruding directly in the path of the coin. As will be of course understood the sleeve 1 and arms 3 and 5 and 6 are all in one piece and the sleeve 1 and shaft 2 may also be one piece.

7 is a sleeve similar to 1 and keyed to a shaft 7', similarly supported from the plate J, and has forming part of it an arm 8, to which is connected one end of a spring 9, the other end of said spring being connected to the frame of the attachment, and to this sleeve 7 is also connected, so as to form a part of it, the arms 10, 11, and 12. As will be seen in Figs. 5 and 6, the arm 10 of said sleeve 7 is in engagement with the hooked arm 6 of the sleeve 1, and is normally held thereby, and for convenience I shall use the word "sleeve," throughout this specification as referring to the locking mechanism above described, including thereby the shaft on which it turns, since the sleeves above mentioned are keyed to the shafts, though as stated, the arms might be cast directly to the shafts, as will be understood.

13 is a bar or rod which is adapted to move on the spindle 14 connected with the plate J, and this arm 13 is normally in the position shown in Fig. 4, being held up by the arm 11 of the sleeve 7, on which arm of the said sleeve rod 13 rests. The function of this rod or bar 13 is to hold the attachment locked through the medium of a pin or stud y on the cog-wheel S, against which arm 13 said pin or stud strikes or engages, if an attempt is made, before the proper coin has been dropped

into the machine, to move the cog-wheel S (from the position shown in Fig. 4) in the direction of the arrow. The cog-wheel S is weighted on one side so that normally the pin *y* will be kept a slight distance from the arm 13. There is also, on the cog wheel S a pin *i*, which trips the hammer 15 to ring the bell 16 when the wheel S has made one revolution, and the cross head M has been returned to its normal position, (at which time the phonograph will begin to talk) and this pin *i* trips the hammer 15 as it moves around by striking the lug 17 on the same shaft as the hammer, thereby lifting the latter and permitting it to fall, striking the bell.

W is a crank shaft mounted in a bearing 20 in the plate J, by means of which the cog wheel T is turned, to turn the cog wheel S, and to the inner end of said shaft is connected the cog wheel T, which is constructed as shown in Fig. 3 with cog teeth on one side or portion thereof and ratchet teeth on the other side or portion thereof, with which ratchet teeth a suitable pawl 21 is adapted to engage, to lock the wheel against backward movement. The wheel T is connected to the crank W by a frictional connection, that is, the cog wheel T is milled out at 24 to receive a stiff metal spring washer 22, over which is screwed a nut 23, uniting said washer to the shaft 19. So long as the wheel S is locked, though the crank may be turned in either direction, the attachment will not be operated, but the crank will revolve as will also the spring washer, but as soon as the cog wheel S has been released, that is, as soon as the arm or trigger 5 has been tripped by a coin, and the arm 13 lowered, and the crank turned, the tension of the spring washer 22 on the cog wheel T being greater than the resistance of all of the other parts to be moved, the wheel T will turn, rotating the driving wheel S. As the pin *y* moves around, it strikes the arm 12 on the sleeve 7 and thereby raises the arm 11 thereof, which sets up the rod 13 and holds it raised, and lowers the arm 10 of said sleeve 7, which is held by the toothed arm 6, which has been restored to its original position by the spring 4 connected with the said sleeve 1 or the arm 3 thereof, as will be readily understood.

As will be seen from the foregoing description, when the proper coin is dropped into the machine it travels through the coin chute Y and strikes on the arm or trigger 5 of the sleeve 1, releasing the arm 10 of the sleeve 7 from the toothed arm 6 of sleeve 1 with which it engages, and thereby lowering the rod 13, so that the wheel S may be rotated. The locking levers will then be set up or locked again by means of the pin *y*, striking the arm 12 on the sleeve 7, in passing, as just before explained. When the driving wheel S turns, it moves the cross head M by means of the connecting rod Q, breaking the circuit at one side of the attachment by removing the plug N from the contacts or electrodes R, R, and

as said cross head moves along it raises the rocking bar K, since the pin *r* on said cross head, traveling in a horizontal plane, strikes the rib *k'*, on the underside of the rocking bar, thereby raising said rocking bar and raising the phonograph arm, which is also carried over to the forward end of the phonogram, or the commencement of the record by means of the post *q* on the cross head M, which is adjustable, so as to strike the phonograph arm, to carry it either to the beginning of the record on the inner end of the phonogram or to any point thereof, where said arm is left, and as soon as the phonograph arm is moved, the contacts or terminals *c* and *d* will be united and the motor circuit closed at that point. The phonograph has not yet commenced to operate, since the motor circuit is still open, the plug or electrode N being removed from the contacts or electrode R, R, but by continuing the turning of the crank, and the revolution of the wheel S, the cross head M is returned to its original position, the rocking bar K is lowered and with it the phonograph arm, and the plug N is again inserted between the metal contacts R, R, thereby completing the motor circuit. The phonograph will now begin to talk, since the phonograph arm, and with it the reproducer, carried thereby, has been brought to the commencement of the record, or some desired point thereof, and left in that position and automatically lowered when the cross head was returned to its normal position.

The notice to the listener that the circuit is closed is given by the ringing of the bell in the manner before explained, and the phonograph ceases to operate as soon as the phonograph arm has traveled over and reached the terminal or electrode *d*, forcing it away from the terminal or electrode *c*, the motor circuit being thereby broken, and the phonograph ceasing to talk.

From the foregoing it will be seen that the power which I preferably employ to operate the phonograph is derived from an electric battery and motor, and that the motor circuit is normally open and can be made and broken at two points; that the phonograph arm, and reproducer, when the phonograph is at rest, are down, or lowered, and at the end of the forward movement of the said phonograph arm, or at some point away from the beginning of the record upon the phonogram, while in the application filed by me on the 31st day of January, 1891, and serially numbered 379,824, the phonograph arm is normally raised from the phonogram, and at the commencement of the record thereon; that the phonograph arm normally resting on the rocking bar K keeps the circuit broken at that point by operating the circuit opening and closing device carried by the rocking bar, and that this device is adjustable, and may be fixed at any point on the said rocking bar, so that the phonograph arm will break the circuit and stop the motor at any

desired point, according to how much of the record upon the phonogram it is desired shall be heard. It is obvious, however, that if desired, the reproducer may be normally raised, and at the end of the record upon the phonogram instead of being normally lowered, as hereinbefore described, and in such a case it will only be necessary to shift the phonograph arm and lower it at the end of its movement toward the beginning of the record.

While I have shown and described phonographs as the mechanism to be thrown into operation by an attachment embodying my invention, yet I do not limit my invention to its use with phonographs, nor do I mean to limit my invention to the specific construction, as hereinbefore described and shown in the drawings of the coin controlled attachment for operating phonographs, nor to the particular construction of devices, separately or in combination forming parts thereof, and I use the word phonographs throughout this specification and the claims forming a part thereof, as a generic term, intended to include all talking machines such as the graphophone and the phonograph-graphophone.

I believe that I am the first to conceive and produce the broad fundamental combinations between a phonograph coin controlled mechanism and mechanism to shift or raise or lower the reproducer which are necessary to the production of coin controlled phonographs. And I believe that I am the first to combine such coin controlled mechanism with a phonograph that is operated by an electric motor, and also the first to include the motor in a circuit, which can be opened at two points in the operation of the coin controlled phonographs. But I do not claim in this application the broad and fundamental combinations indicated, since these are all claimed in my other application, Serial No. 379,824, filed January 31, 1891, for attachments for operating phonographs, which, in a set of three applications filed by me to cover all my inventions, is made the application wherein I have claimed my generic invention.

The other of the three applications referred to in my application, Serial No. 384,477, filed March 10, 1891, for a machine for operating phonographs, in which is claimed a specific construction not shown either in this application or in my aforesaid application, Serial No. 379,824.

What I do claim in this application, however, is—

1. The combination, with a coin controlled phonograph, of means for shifting the reproducer, and means operated by the shifting means for lowering the reproducer, substantially as described.

2. The combination, with a coin controlled phonograph, of means for shifting the reproducer, and means operated by the shifting means for raising and lowering the reproducer, substantially as described.

3. The combination, with a phonograph, of a coin controlled mechanism for shifting and lowering the reproducer and throwing the phonograph into operation, and means operated by the phonograph for stopping the phonograph, substantially as described.

4. The combination, with a phonograph, of coin controlled mechanism, and means operated by it for lifting, shifting and lowering the reproducer, and throwing the phonograph into operation, and means operated by the phonograph for stopping the phonograph, substantially as described.

5. The combination, with a phonograph operated by a motor, of coin controlled mechanism for shifting and lowering the reproducer and starting the motor, and means operated by the phonograph for stopping the motor, substantially as described.

6. The combination, with a phonograph operated by a motor, of coin controlled mechanism for raising, shifting and lowering the reproducer and starting the motor, and means operated by the phonograph for stopping the motor, substantially as described.

7. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of a coin controlled mechanism for shifting and lowering the reproducer and closing the motor circuit, and means operated by the phonograph for opening the motor circuit, substantially as described.

8. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of coin controlled mechanism for lifting, shifting and lowering the reproducer and closing the motor circuit, and means operated by the phonograph for opening the motor circuit, substantially as described.

9. The combination, with a phonograph operated by a motor, of a circuit breaker in the motor circuit, normally held open by the reproducer or phonograph arm at the end of the record, and means for closing the circuit at the said circuit breaker when the phonograph is thrown into operation, substantially as described.

10. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of means to raise and lower the reproducer, a circuit making and breaking device to close the circuit operated by the reproducer in moving from its normal position, and operated by said reproducer on returning to its normal position to open the circuit, substantially as described.

11. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of mechanism which is normally held locked and is released by a coin to shift and lower the reproducer and close the motor circuit, and means to relock said mechanism simultaneously with the closure of the motor circuit, substantially as described.

12. The combination, with a phonograph operated by a motor, and having its motor circuit

circuit normally open, of mechanism which is normally held locked and is released by a coin to lift, shift and lower the reproducer and close the motor circuit, and means to relock said mechanism simultaneously with the closure of the motor circuit, substantially as described.

13. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of mechanism which is normally held locked and is released by a coin to shift and lower the reproducer and close the motor circuit, means to relock said mechanism simultaneously with the closure of the motor circuit, and means operated by the reproducer to open said circuit, substantially as described.

14. The combination, with a phonograph operated by a motor, and having its motor circuit normally open, of mechanism which is normally held locked and is released by a coin to lift, shift and lower the reproducer and close the motor circuit, means to relock said mechanism simultaneously with the closure of the motor circuit, and means operated by the reproducer to open said circuit, substantially as described.

15. The combination, with a phonograph, of a motor for operating it in a circuit which can be opened and closed at two points, an attachment normally held locked but released by a coin to open said motor circuit at one of said points and to close it at the other point, and to shift and lower the reproducer, means to hold the circuit closed at the second point, and means to simultaneously close the circuit at the first point and relock the attachment, substantially as described.

16. The combination with a phonograph, of a motor for operating it in a circuit which can be opened and closed at two points, an attachment normally held locked, but released by a coin to open said motor circuit at one of said points and close it at the other point, and lift, shift and lower the reproducer, means to hold the circuit closed at the second point, and means to simultaneously close the circuit at the first point and relock the attachment, substantially as described.

17. The combination, with a phonograph, of a motor for operating it in a circuit which can be opened and closed at two points, an attachment normally held locked, but released by a coin to open said motor circuit at one of said points and close it at the other point, and to shift and lower the reproducer, means to hold the circuit closed at the second point, means to simultaneously close the circuit at the first point and relock the attachment, and means operated by the reproducer to open the circuit at the second point, substantially as described.

18. The combination, with a phonograph, of a motor for operating it in a circuit that can be opened and closed at two points, an attachment normally held locked, but released by a coin to open said motor circuit at one of said

points and close it at the other point, and to lift, shift and lower the reproducer, means to hold the circuit closed at the second point, means to simultaneously close the circuit at the first point and relock the attachment, and means operated by the reproducer to open the circuit at the second point, substantially as described.

19. The combination, with a phonograph, of a shifting device for the reproducer, and a coin controlled driving wheel adapted to move the said shifting device, substantially as described.

20. The combination, with a phonograph, of a shifting device for the reproducer, a driving wheel which is normally locked, and can be released by a coin to operate said shifting device, and means to rotate the said wheel, substantially as described.

21. The combination, with a phonograph, of a shifting device for the reproducer, a driving wheel to operate said shifting device, coin controlled mechanism to lock the said wheel, and means to rotate the said wheel, substantially as described.

22. The combination, with a phonograph, of an adjustable device to shift the reproducer over the record upon the phonogram, a driving wheel connected with the said adjustable device, a coin controlled mechanism normally locking the said wheel, and means to rotate the said wheel to shift the said device, and thereby shift the reproducer, substantially as described.

23. The combination, with a phonograph, of a device to raise and lower the reproducer, a wheel, which is normally locked and can be released by a coin, connected with the said device to operate it, and means to rotate the said wheel, substantially as described.

24. The combination, with a phonograph, of a device to raise and lower the reproducer, a driving wheel to actuate said raising and lowering device to raise and lower the reproducer, means which normally lock the said wheel, and are released by a coin, and means to rotate the said driving wheel, substantially as described.

25. The combination, with a phonograph, of a device to raise and lower the reproducer, shifting means for the said reproducer, and a coin controlled driving wheel operating the said shifting means, substantially as described.

26. The combination, with a phonograph, of a device to raise and lower the reproducer, shifting means operating on said raising and lowering device to raise and lower it, a driving wheel, which is normally locked, but can be released by a coin, connected with the said shifting means to operate it, and means to rotate said driving wheel, substantially as described.

27. The combination, with a phonograph, of a device to raise and lower the reproducer, shifting means for the said reproducer, the said shifting means operating upon the raising and lowering device to raise and lower it,

and a coin controlled driving wheel operating the said shifting means, substantially as described.

28. The combination, with a phonograph, of a device to raise and lower the reproducer, a traveling cross head or carriage to operate said device to raise and lower it and to shift the said reproducer, a driving wheel connected with the said carriage to impart motion thereto, coin controlled mechanism to lock the said wheel, and means to rotate the said wheel and shift the said cross head, and thereby raise, lower and shift the reproducer, substantially as described.

29. The combination, with a phonograph, of a shifting device for the reproducer, a driving wheel connected with the said shifting device, the said wheel being normally held locked, and being released by a coin, and means to rotate the said driving wheel consisting of a crank, a primary wheel, and a frictional connection between the said crank and primary wheel, whereby the crank may be turned without turning the said primary wheel, substantially as described.

30. The combination, with a phonograph, of a shifting device for the reproducer, a driving wheel connected with the said shifting device, the said wheel normally being held locked, but being released by a coin, and means to rotate said driving wheel, which means consist of a crank, and a primary wheel adapted to be turned thereby, the said primary wheel and crank being connected together in such manner that the crank may be turned without turning the primary wheel so long as the driving wheel is locked, substantially as described.

31. The combination, with a phonograph, of a device to raise and lower the reproducer, a shifting device for the reproducer, and means to operate the said shifting device, which means consists of a crank, and a primary wheel connected with the said crank in such manner that the crank may be turned without turning the said primary wheel so long as the driving wheel remains locked, substantially as described.

32. The combination with a phonograph, the normal position of the reproducer of which is down and at the end of its movement, and at the end of the record upon the phonogram, of a device adapted to shift the reproducer to the beginning of the record upon the phonogram, and coin controlled mechanism connected with the said device to shift the reproducer, the said mechanism consisting of a wheel upon one revolution of which the said shifting device will be moved away from and returned to its starting point or normal position, substantially as described.

33. The combination, with a phonograph, of a device to raise and lower the reproducer, means operating on the said device to raise and lower it, a driving wheel connected with said raising and lowering means, the said driving wheel being normally held locked,

and being released by a coin, and means to rotate said driving wheel, the said rotating means consisting of a primary wheel, a crank adapted to turn the said primary wheel, and means connecting the said crank and primary wheel, whereby the crank may be turned without turning the said primary wheel, substantially as described.

34. The combination, with a phonograph, of a driving wheel which remains normally locked but can be released by a coin, a primary wheel which engages with the driving wheel to rotate it, and a crank frictionally attached to the primary wheel, substantially as described.

35. The combination, with a driving wheel S, of the wheel T, constructed as shown and described, and consisting of a part having cog teeth meshing with the wheel S, and a part with ratchet teeth, a spring pawl locking the said wheel T, a spring washer 22, a nut 23 and a crank 18, all constructed to operate substantially as shown and described.

36. In a coin controlled mechanism, the combination with the wheel S, constructed as shown, and described, and having a stud or pin *i* thereon, of the wheel T constructed as shown and described, a crank W, a bell 16 and a hammer 15, all arranged to operate substantially as and for the purpose set forth.

37. In a coin controlled mechanism, the combination with a coin chute, of the driving wheel S, having the stud *y* thereon, and mechanism operated by a coin passing through the said chute, the said mechanism consisting of a sleeve 1, arms 3, 5 and 6 and spring 4 connected with the said sleeve, sleeve 7, arms 8, 10, 11 and 12 and spring 9 connected therewith, and rod 13, all arranged to operate substantially as shown and described.

38. In a coin controlled mechanism, the combination, with the driving wheel S, constructed as shown and described, being weighted at one side, and having studs *y* and *i* thereon, of the wheel T constructed as shown and described and consisting of a part having cog teeth to mesh with the wheel S and a part having ratchet teeth, a pawl to lock said wheel T, a spring washer 22, a nut 23, a crank 18, mechanism operated by a coin, consisting of a sleeve 1, arms 3, 5, and 6, and a spring 4 connected with the said sleeve, a sleeve 7, arms 8, 10, 11, and 12, and a spring 9 connected therewith, and a rod 13, all arranged to operate substantially as shown and described.

39. The combination, with the wheel S and stud *y* thereon, of a coin actuated mechanism consisting of a sleeve 1, arms 3, 5, and 6, and a spring 4 connected with the said sleeve, a sleeve 7, arms 8, 10, 11, and 12, and a spring 9 connected therewith, and a rod 13, all arranged to operate substantially as described.

40. In a coin controlled mechanism, the combination, with a driving wheel, of a coin chute, a trigger pivoted therein, and a sleeve having a plurality of arms, one of which is engaged by the said trigger another of which locks

the said wheel and another of which projects contiguous to the said wheel and is actuated thereby to cause the trigger and the first named arm to engage, substantially as described.

41. The combination, with the phonograph arm of a phonograph, of the rocking bar K, having a rib k' , and the cross head M having the post q and pin r , substantially as described.

42. The combination, with a phonograph, of the rocking bar K, constructed as shown and described, the cross head M constructed as shown and described, a driving wheel S and a connecting rod Q, substantially as described.

43. The combination, with a phonograph operated by a motor, of the rocking bar K, constructed as shown and described, a circuit

making and breaking device connected therewith, the cross head M constructed as shown and described, a circuit making and breaking device connected therewith, and a coin controlled driving wheel and connecting rod for operating the said cross head, substantially as described.

44. The combination, with the cross head or carriage M, guide rod L, and driving wheel S, of coin controlled mechanism to release the said wheel, substantially as described.

In testimony whereof I have signed my name to this specification the 9th day of February, A. D. 1891.

ALBERT K. KELLER.

In presence of—

FRED H. KNAPP,

GEO. W. AYERS.

(No Model.)

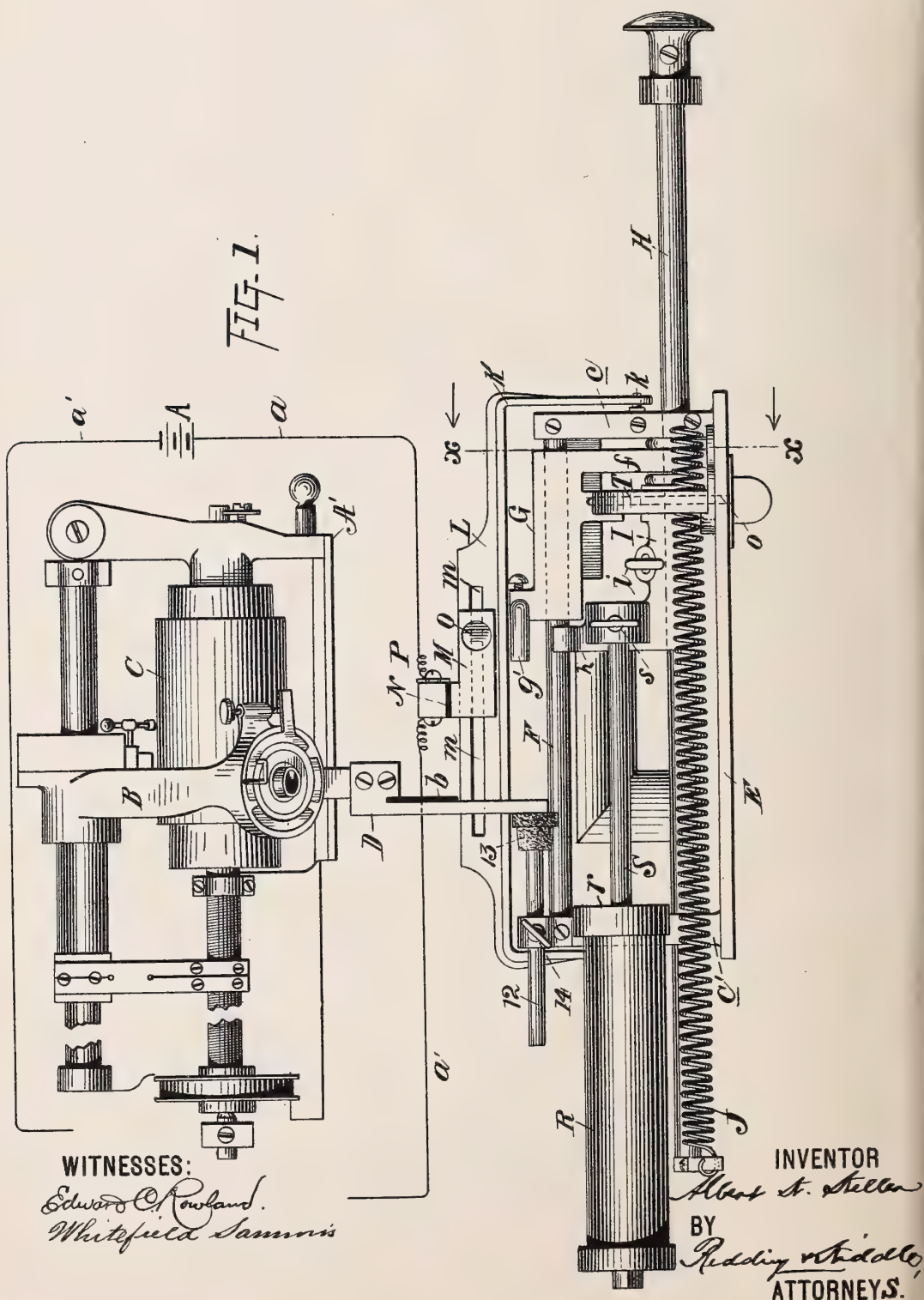
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A. K. KELLER.

MACHINE OR ATTACHMENT FOR OPERATING PHONOGRAPHS.

No. 518,192.

Patented Apr. 10, 1894.



WITNESSES:
Edward C. Rowland.
Whitefield Sammons

INVENTOR
St. Steffen
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(No Model.)

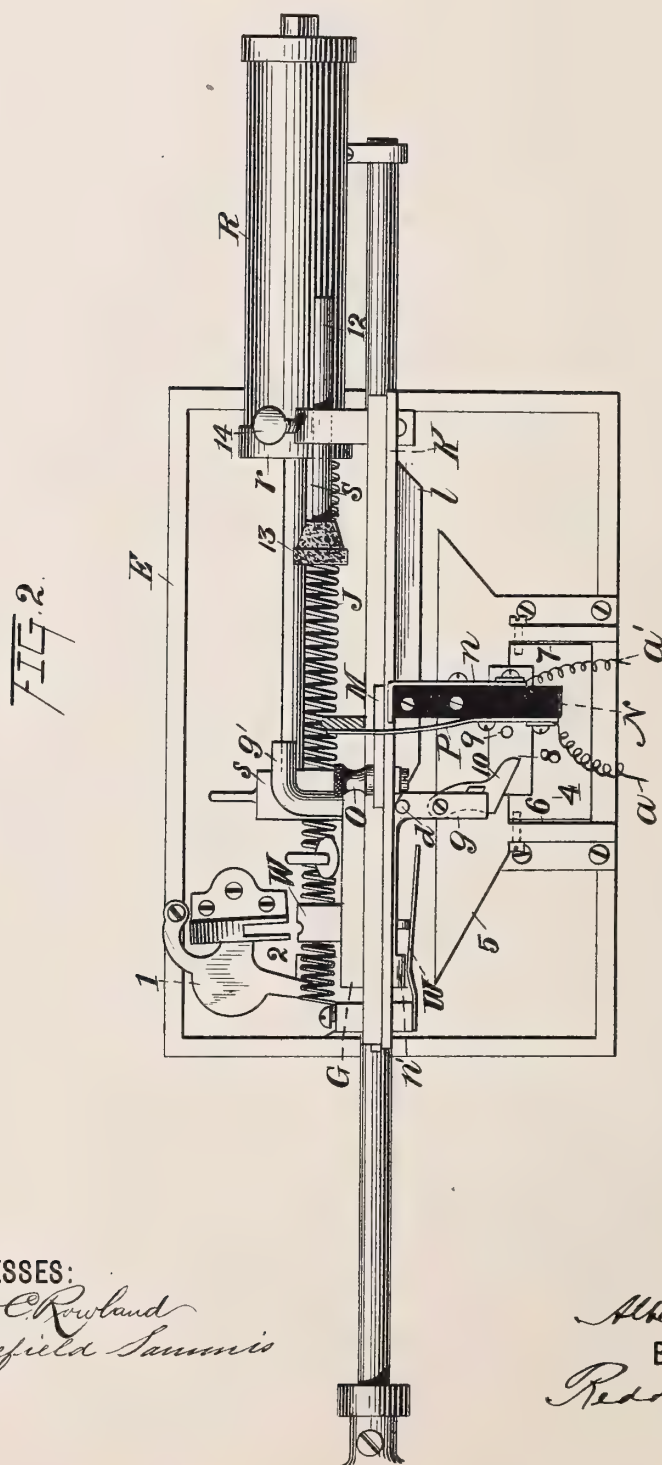
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WITNESSES:

Edward C. Rowland
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ATTORNEYS.

(No Model.)

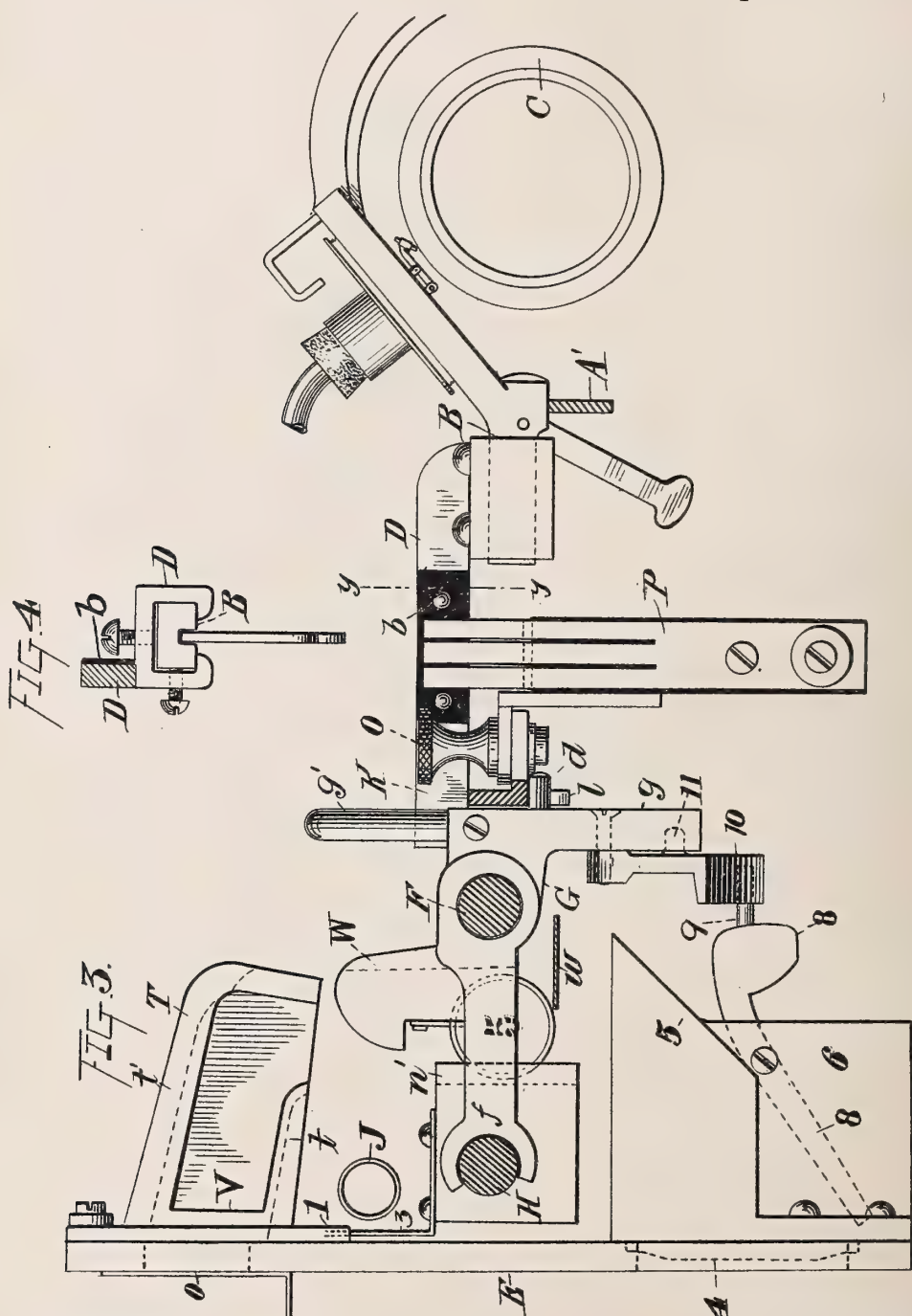
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WITNESSES:

Edward C. Rowland,
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UNITED STATES PATENT OFFICE.

ALBERT K. KELLER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AUTOMATIC PHONOGRAPH EXHIBITION COMPANY OF NEW YORK.

MACHINE OR ATTACHMENT FOR OPERATING PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 518,192, dated April 10, 1894.

Application filed March 10, 1891. Serial No. 384,477. (No model.)

To all whom it may concern:

Be it known that I, ALBERT K. KELLER, of New York city, in the county and State of New York, have invented certain new and useful
5 Improvements in Machines or Attachments for Operating Phonographs, of which the following is a specification.

My invention relates to machines or attachments for operating or throwing into operation phonographs or talking machines through
10 the medium of a coin and in the accompanying drawings forming a part hereof I have illustrated one form of mechanism embodying my invention which remains inoperative
15 for the purpose desired until after the insertion of a suitable coin; I have also shown a phonograph which is adapted to be operated by an electrically driven motor, not shown, the motor circuit being normally open and adapted
20 to be closed after the coin has been inserted and my invention also consists in the novel features hereinafter set forth and claimed.

Referring to the drawings,—Figure 1 is a top view of a phonograph and of a machine embodying my invention connected therewith
25 showing the manner of attaching such machine with the phonograph and the arrangement of the two machines with relation to each other; it also shows the position of the
30 phonograph arm after a coin has been inserted and the attachment operated, that is, after the phonograph arm has been moved from its normal position (at the end of the phonogram) and carried to the inner end of said
35 phonogram, the motor circuit closed and the phonograph in operation. Fig. 2 is a side view in elevation, looking from the inside or from the phonograph, of a machine embodying my invention the parts shown being in
40 their normal position. Fig. 3 is an end view taken through line $x-x$ of Fig. 1, looking in the direction of the arrows on said figure; and Fig. 4 is a sectional view taken through line
45 $y-y$ of Fig. 3 showing the manner of connecting the attachment to the phonograph.

The style of phonograph or talking machine with which I preferably employ my invention is shown in Fig. 1 and such phonograph is adapted to be operated by an electrically

driven motor, not shown, connected with a source A of electricity by wires $a a'$.

B is the phonograph arm and C the phonogram or recording cylinder upon which have been registered the sounds desired to be reproduced in the manner now well understood;
55 and to this phonograph arm B is attached an arm or extension D (see Fig. 4) which has a piece of insulating material b on one side thereof for purposes to be presently explained. When the phonograph is at rest
60 and the machine for automatically operating the same is in its normal position, that is, before a suitable coin has been inserted, the phonograph arm B is down in contact with the phonogram C or resting on the frame A'
65 of the phonograph at the end of the forward movement of said phonograph arm and the normal position of the parts of a machine embodying my invention is shown in Fig. 2.

E is a metal plates from which extend
70 arms or brackets $c c'$ and to this plate and these brackets forming part thereof are connected the parts and devices comprising the mechanism proper embodying my invention.

F is a guide-rod supported in bearings in the brackets $c c'$ and upon this guide rod
75 travels a cross head or carriage G which is constructed as shown, having at one end a downwardly extending arm g from which project a pin d and an upwardly extending arm
80 or post g' . From the other end of said cross head projects an inwardly extending arm f (see Fig. 3) which extends to and grasps a sliding bar or push rod H and is adapted to move
85 therealong for purposes to be presently explained. To the rod H is attached a cross head or carriage I connected therewith by means of a set screw i and this cross head has an outwardly extending arm h similar to the inwardly extending arm f of the cross
90 head G, the outer end of which arm h extends to and grasps the guide rod F and is adapted to move therealong, and these two cross heads G and I are adapted to be keyed or united by
95 a coin as will be hereinafter explained and when so united comprise a movable coin-carrier. To one end of rod H is attached one end of a spiral spring J, the other end of said

spring being attached to the plate E, (see Fig. 1) and this rod H passes through and is supported by the brackets *c c'* and is adapted to be moved therethrough, and as will be readily understood, when the rod H is forced in, it expands the spring J connected with it and when the rod H is released or the pressure removed, the tension of the spring J will return said rod to its normal position.

To the brackets *c c'*, is connected or pivoted at *k k*, a rocking bar K, or lifting device which is constructed with a downwardly projecting inclined rib *l* which extends for a part of its length only and an outwardly extending rib or flange L which has a slot or guide-way *m* therein and upon this rocking-bar K rests the phonograph arm B, or the extension D thereof, so that when said rocking-bar moves up and down, it will raise and lower said phonograph arm and this rocking-bar K normally rests on the pin *d* on the cross head G (see Fig. 2) and is raised by the pin *d* striking the rib *l* under which rib the pin moves with the cross head G and is lowered when the pin *d*, in returning, passes beyond the rib *l*, as will be readily understood. On this rocking-bar K is connected an adjustable circuit making and breaking device shown in Figs. 2 and 3 which consists of a metal piece M attached to said rocking-bar by means of the screw O which passes through said strip into and through the slot *m* and to this metal piece M is united a block of insulating material N to one side of which is connected a metal strip *n* which is bent over across the top of said insulated material and extends slightly beyond it (see Fig. 2) and to this metal strip runs wire *a'* connecting with the battery and motor. To the other side of said block of insulating material is united a metal forked strip or spring contact P, to which runs wire *a* connecting with said battery and motor and the motor circuit is adapted to be closed when the strips P and *n* make contact, but they are normally kept apart by the phonograph arm B, or the extension D thereof, keeping the circuit open, since the spring-contact P is in direct contact with the insulating piece *b* on the extension D when the phonograph is at rest, as shown in Fig. 2, but when the arm B is moved away the spring-contact P will return itself in contact with the other metal piece *n*, thereby closing the motor circuit. As just stated, this electrical circuit making and breaking device is connected with the rocking-bar K by means of the adjustable screw O which is adapted to move along said slot and may be secured at any point on said rocking-bar according to how much of the record registered upon the phonogram it is desired shall be heard, said device being adapted to be operated by the phonograph arm at any point in its forward travel to break the motor circuit and thereby stop the phonograph. I do not limit myself however, to the use of the circuit making and breaking device shown and de-

scribed, nor is it essential that the circuit making and breaking device should be connected with the rocking bar, since any other suitable device that is adapted to be operated by the phonograph for the purposes set forth may be employed within the spirit of my invention.

Besides the adjustable circuit making and breaking device shown connected with the rocking-bar to regulate how much of the record on the phonogram shall be heard and which is operated by the phonograph arm at any point in its forward travel, I provide an adjustable device (see Fig. 1) consisting of a rod 12 having a head 13 of rubber or other soft material, which rod passes through the bracket *c'* and is adapted to be held at any point by a set screw 14 to regulate how much of the record shall be heard by limiting the backward movement of the phonograph arm and stopping such arm at any point from the inner end of the phonogram or commencement of the record.

In order to prevent the rod H from being pushed in too rapidly or forcibly and thereby injure the parts and throw the phonograph out of adjustment, I employ an air-cushion or other suitable retarding or regulating device (see Figs. 1 and 2) and this consists of an air compression chamber or cylinder R, supported in a bearing *r* secured to the bracket *c'*, and through this air chamber is adapted to work in and out a piston rod S which is connected at one end to an arm *s* which rises from cross head I, attached to the rod H; therefore when rod H is pushed in, it forces the piston rod S into the cylinder R thereby retarding the inward movement of said rod and the parts connected with it and operated thereby.

Before a proper coin is inserted into the machine, the rod H and parts connected with it may be moved in and out without operating the attachment or the phonograph, but when a suitable coin has been inserted into the machine, it locks or keys the cross heads G and I, enabling the attachment to operate and at the same time operate the phonograph as will now be explained.

In plate E there is an opening *o* for the insertion of the coin and the coin chute is connected with this plate (see Fig. 3) so that the coin will pass directly therethrough, preferably edgewise or parallel to the line of travel, and this coin chute is constructed as shown in said figure of an inclined plate T which has a flange or rib *t* on the lower edge extending for only part of its length and another flange or rib *t'* on its upper edge of one side thereof extending along its entire length and down one end and between which ribs the coin travels and the distance between these ribs is adjusted according to the size of the predetermined coin desired to operate the machine; to this plate T over ribs *t* and *t'* is attached another open plate or frame V. These plates and ribs make a chute for the coin, which is

inclined in two directions. It is inclined downward so that the coin will readily roll down the inclined rib *t*, and inclined or tilted sidewise, so that the coin is tilted over against the upper edges of the open plate *V*. If the coin is below the proper size, it will not reach as high as this edge, and will lop over and fall directly into the bottom of the box instead of passing between and keying the cross heads.

From the cross head *G* rises an arm *W* which is milled out from end to end as shown in dotted lines in Fig. 3 and forms a continuation of the coin chute, it being located directly thereunder and the coin passing through said chute will pass into and through said arm and drop on to a short metal piece or plate *w* which projects thereunder (see Fig. 2) and said coin is thereby prevented from dropping into a coin receptacle or hopper (to be hereinafter explained) until it has performed its function, being also held up against lopping over to one side by the guide in said arm *W* and against lopping over to the other side by a rib *n'* on the cross head *I*, thus keying these two cross heads together so that when the rod *H* is then pushed in both cross heads will move together or be forced over to the limit of their inward movement, the coin being prevented from dropping after it has passed the plate *w* only by the pressure against it of the cross heads, but as soon as the cross heads have traveled beyond said plate *w* and the inward pressure removed, as there will be nothing to keep the coin from dropping, it will fall into a coin receptacle as will be readily understood. Of course the coin chute can be arranged to guide the coin on its side instead of edgewise and the cross heads may be locked for the desired purpose by a coin so introduced within the spirit of my invention. To prevent another coin from being inserted into the machine before the rod *H* has returned, I attach to the plate *E* a pivoted device or arm 1 which is constructed as shown in Fig. 2 with a lug 2 on one side, which when the cross head *I* is forced in by rod *H*, moves in front of the opening *o*, closing said opening and this lug is normally kept away from said opening by a projection 3 attached to the cross head *I*, with which projection the lower end of said pivoted arm 1 engages.

In order to detect whether or not the coin employed is a genuine coin, since the machine may be operated by a piece of metal if of the proper size, I secure in an opening in the plate *E* a piece of glass 4 behind which is arranged a pivoted device which retains the coin and holds it to view during the operation of the phonograph and until said device is tripped by the cross head *G* after another coin has been inserted. The contrivance which I employ for this purpose is as follows: To the plate *E* is secured a coin receptacle or hopper 5 having downwardly extending sides 6, 7, to which is pivoted a bottom piece 8 (see Fig. 3) and from the upper portion of said

bottom piece projects a pin 9 which is adapted to engage with a trip or pivoted arm 10 attached to one side of and projecting downwardly from the arm *g* on the cross head *G* and the arm 10 is held against backward movement by a lug 11 thereon which strikes against the arm *g* on cross head *G* (see Fig. 2). When a coin has been inserted of the proper size and locks the cross heads together to enable them to be moved together as before explained, and said coin has been released and dropped, it will fall into the hopper down on to the lower part of the bottom piece 8 directly in front of the glass, exposing such coin to view, as just set forth, and said bottom piece is tripped or tilted to throw out the coin by the arm 10 on cross head *G* striking the pin 9 as said cross head travels in its succeeding inward movement and the coin will drop into another coin receptacle or money box, not shown, placed immediately below; the arm 10 in returning will ride over the pin 9 without tilting the pivoted bottom, as will be readily understood.

The operation of the machine is as follows: The normal position of the phonograph arm is, as before stated, at the end of its forward movement or at some intermediate point and preferably down in contact with the phonogram; it must, therefore, be returned to the commencement of the record or phonogram or at some intermediate point and to do so must first be raised lest the needle point mar the record in moving over the phonogram; it is also normally against the spring-contact *P* keeping the motor circuit open and must therefore be moved away to close the circuit. The phonograph arm may however, if desired, be normally held in a raised position, at the end of its forward movement or at some intermediate point ready to be moved without first raising it and after it has been moved backward to the desired point, lowered and subsequently raised within the spirit of my invention.

As will be understood from the previous description, the rod *H* and cross head *I* which is attached to it may be pushed in and out without operating or throwing the phonograph into operation until a proper coin has been inserted into the machine and keys said cross head to the cross head *G*, which latter cross head is adapted to operate to throw the phonograph into operation; that is, the cross head *G* constitutes a movable operating device or "driven" part which directly operates to throw the phonograph into operation after the insertion of a suitable coin but which remains normally inoperative or idle for the purposes desired until it is connected with other mechanism or "driving" part which is adapted to operate or move it through the medium of a coin.

Assuming the phonograph arm to be at its normal position, as is the position of the parts of the attachment shown in Fig. 2, a suitable coin is inserted in the opening *o* in the plate

E; it will travel into the coin chute and ride on the rib *t* of the plate T and around its rounded end passing into the guide arm W and drop onto the plate *w* being held up in place by said plate and the guide in arm W and the rib *n'* on the cross head I; thus the two cross heads are keyed together and when the rod H is now pushed in it will move both cross heads, and the post *g'* on the cross head G will strike the phonograph arm B or extension D and carry or shift it over to the desired point. Before however, the post *g'* has reached the phonograph arm, or at the same time, the pin *d* on the said cross head will strike the inclined rib *l* on the rocking-bar K and as said cross head moves along the rocking-bar will be lifted, thereby raising the phonograph arm so that it may be moved to any point of the record without destroying it. The cross heads are moved over until the post *g'* strikes the rod 12 and when the pressure is removed the coin will drop into the hopper 5 onto the lower portion of the bottom piece 8 and be exposed to view through the glass 4 and the spring J will return the cross heads to their normal position ready to be keyed by another coin, meanwhile remaining inoperative to operate the phonograph. The phonograph arm has been left at the commencement of the record or at some desired intermediate point and as the motor circuit was closed by the movement of the phonograph arm away from the circuit making and breaking device as before explained the phonograph will begin to talk since the phonograph arm has been lowered to the phonogram by the lowering of the rocking bar K by the return of the cross head G, since the pin *d* thereof has passed beyond the rib *l* on said rocking-bar, permitting it to lower. The phonograph arm is carried forward by the feed screw and mechanism forming part of the phonograph until it reaches the circuit making and breaking device which it operates to again open the motor circuit and the phonograph ceases to talk or operate until another suitable coin is inserted and the motor circuit closed again as fully set forth.

While I have shown and described my invention as applied to phonographs as the mechanism to be automatically thrown into operation by a machine embodying my invention, yet I do not limit my invention to its use with phonographs or talking machines; nor do I limit my invention to the particular construction of parts and devices, separately or in combination comprising the mechanism shown and described which embodies my invention and which efficiently accomplishes the desired results, not to the use of my invention with talking machines or phonographs *per se* since I use the latter term as a generic term and intend to include thereby, all talking machines such as graphophones and phonograph-graphophones.

I believe that I am the first to conceive and produce the broad fundamental combinations

between a phonograph coin controlled mechanism, and mechanism to shift or raise or lower the reproducer which are necessary to the production of a coin controlled phonograph. And I believe that I am the first to combine such coin controlled mechanism with a phonograph that is operated by an electric motor, and also the first to include the motor in a circuit which can be opened at two points in the operation of the coin controlled phonograph. But I do not claim in this application the broad and fundamental combinations indicated, since these are all claimed in my other application, Serial No. 379,824, filed January 31, 1891, for attachments for operating phonographs, which, in the set of three applications filed by me to cover all my inventions is made the application wherein I have claimed my generic inventions. Nor do I claim broadly in this application the combination of coin controlled mechanism with a phonograph where the operation is that the reproducer is normally in contact with the phonogram at the end of the record, and, when the phonograph is operated in conjunction with the coin controlled mechanism is first lifted off the phonogram, then shifted to the beginning of the record, and then lowered. Nor do I claim such a coin controlled phonograph in combination with a motor for operating it, the circuit of which motor is normally held open by the reproducer at the end of the record. These combinations are claimed broadly in my application, Serial No. 381,404, filed February 14, 1891, which, though specific under the aforesaid broad generic application filed January 31, 1891, is still generic to this present application in respect of the last points enumerated.

It will be observed that in this present application, all of the claims are limited to operating mechanism in which there are two co-operative parts which are keyed by a coin. But without otherwise limiting myself to the exact details of construction shown,

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with a phonograph, of a device to raise and lower the reproducer, and means to operate on said device to raise and lower it, said means being constructed in two parts which can be keyed or united by a coin, substantially as and for the purpose set forth.

2. The combination, with a phonograph, of a device to raise and lower the reproducer, and means which can be moved to operate on said device to raise and lower it and at the same time shift the reproducer, said means remaining normally inoperative and constructed in two parts which can be keyed or united by a coin, substantially as and for the purpose set forth.

3. The combination, with a phonograph, of a device to raise and lower the reproducer, a movable cross head or carriage adapted to operate on said device and lower it, and at

the same time shift the reproducer, another movable cross head which can be united to the first cross head by a coin, and means to move said cross heads, substantially as and for the purpose set forth.

4. The combination, with a phonograph, of a device to raise and lower the reproducer, and means to shift said reproducer and raise and lower said device, which means consist of the cross heads G and I which can be keyed together by a coin, and the rod H to move said cross heads, substantially as and for the purpose set forth.

5. The combination, with a phonograph, of a device to raise and lower the reproducer, means to raise and lower said device and shift said reproducer, which means consist of two cross heads which can be keyed together by a coin, and a device to move said cross heads, substantially as and for the purpose set forth.

6. The combination, with a phonograph having its motor circuit normally open, of a device to raise and lower the reproducer, means to operate on said device to raise and lower it, said means being constructed in two parts which can be keyed or united by a coin, and means operated by the phonograph to open and close the motor circuit, substantially as and for the purpose set forth.

7. The combination, with a phonograph having its motor circuit normally open, of a device to raise and lower the reproducer, means to operate on said device to raise and lower it, said means being constructed in two parts which can be keyed or united by a coin, and an adjustable circuit making and breaking device operated by the phonograph to open and close the motor circuit, substantially as and for the purpose set forth.

8. The combination, with a phonograph, of a lifting device to raise and lower the reproducer, an adjustable circuit making and breaking device connected therewith and operated by the phonograph to open and close the motor circuit, and means to operate on said lifting device to raise and lower it, said means being constructed in two parts which can be keyed or united by a coin, substantially as and for the purpose set forth.

9. The combination, with a phonograph, of a lifting device to raise and lower the reproducer, an adjustable circuit making and breaking device connected therewith and operated by the phonograph to open and close the motor circuit, means to operate on said lifting device to raise and lower it and at the same time shift the reproducer, said means remaining normally inoperative and being constructed of two parts which can be keyed by a coin, substantially as and for the purpose set forth.

10. The combination, with a phonograph, of a device to raise and lower the reproducer, a movable coin carrier to operate on said device to raise and lower it, said carrier remaining normally inoperative and being constructed in two parts which can be united or keyed

by a coin, and means to move said coin carrier, substantially as and for the purpose set forth.

11. The combination, with a phonograph having its motor circuit normally open, of a device to raise and lower the reproducer, a movable coin carrier to operate on said device to raise and lower it, said coin carrier remaining normally inoperative, and being constructed in two parts which can be united or keyed by a coin, means to move said coin carrier, and means operated by the phonograph to open and close the motor circuit, substantially as described.

12. The combination, with a phonograph, of a raising means for the reproducer, shifting means for the said reproducer, which shifting means remains normally inoperative, and means which can be connected to said shifting means by a coin, substantially as described.

13. The combination, with a phonograph, of raising means for the reproducer, shifting means for said reproducer, which shifting means remains normally inoperative, means which can be connected to said shifting means by a coin, and lowering means for the reproducer, substantially as described.

14. The combination, with a phonograph, of raising means for the reproducer, a shifting device for said reproducer, which shifting device remains normally inoperative, driving means which can be connected with said shifting device to operate it by means of a coin, and means to operate said driving means, substantially as described.

15. The combination, with a phonograph, operated by a motor, of means operated by the phonograph to open and close the motor circuit, a shifting device for the reproducer, which shifting device remains normally inoperative, driving means which can be connected to said shifting device by means of a coin, and means to move said driving means, substantially as described.

16. The combination, with a phonograph, operated by a motor, of means operated by the phonograph to open and close said motor circuit, raising means for the reproducer, a shifting device for the reproducer, which shifting device remains normally inoperative, driving means which can be connected to said shifting device by means of a coin, and means to move said driving means, substantially as described.

17. The combination, with a phonograph, of a device to raise and lower the reproducer, means to operate on said device to raise and lower it and shift said reproducer, which means consist of the cross head G, constructed as shown and described, having the post g' and the pin d connected therewith, and the cross head I, constructed as shown and described, which can be keyed to the cross head G by a coin, and a rod H to move said cross heads, substantially as and for the purpose set forth.

18. In a coin controlled mechanism, the combination of the rod H, spring J, cross head I, cross head G, and guide rod F, all constructed and arranged to operate after the insertion of a coin, substantially as and for the purpose set forth.

19. In a coin controlled mechanism, the combination of a rod H, spring J, cross head I, cross head G, guide rod F, cylinder R and piston rod S, all constructed and arranged to operate after the insertion of a coin, substantially as and for the purpose set forth.

20. The combination, with a phonograph, of a device to raise and lower the reproducer, a rod H, spring J, cross head I, cross head G, and guide rod F, all constructed and arranged to operate after the insertion of a coin, substantially as and for the purpose set forth.

21. The combination, with the phonograph arm, of the extension D of said arm, rocking bar K, cross head G, cross head I, guide rod F, rod H, and spring J, all constructed and arranged to operate after the insertion of a coin, substantially as and for the purpose set forth.

22. In a coin controlled mechanism, the combination of the rod H, spring J, cross head I, cross head G, guide rod F and plate W, all constructed and arranged to operate after the insertion of a coin, substantially as described.

23. In a coin controlled mechanism, the combination with the cross head I and rib *n* thereof, of the coin chute having opening *o* and

pivoted arm 1 and lug 2, all arranged substantially as and for the purpose set forth. 35

24. In a coin controlled mechanism, the combination of two movable cross heads to be keyed by a coin, a coin chute composed of the plate T and frame V, the arm or projection W, plate *w*, and rod H, all constructed and arranged to operate substantially as and for the purpose set forth. 40

25. In a coin controlled mechanism, the combination with two movable members to receive the coin and to be keyed thereby, a coin receptacle, having a pivoted bottom, to receive the coin upon its release from the movable members, and a means actuated by one of the movable members to tilt the said bottom, substantially as described. 50

26. In a coin controlled device, the combination with a coin controlled locking device to receive the coin, a receptacle, having a pivoted bottom, to receive the coin upon its discharge from the said device, and means for tilting the said pivoted bottom, the movement of the said means being controlled by the said device, substantially as described. 55

In testimony whereof I have signed my name to this specification the 23d day of February, A. D. 1891. 60

ALBERT K. KELLER.

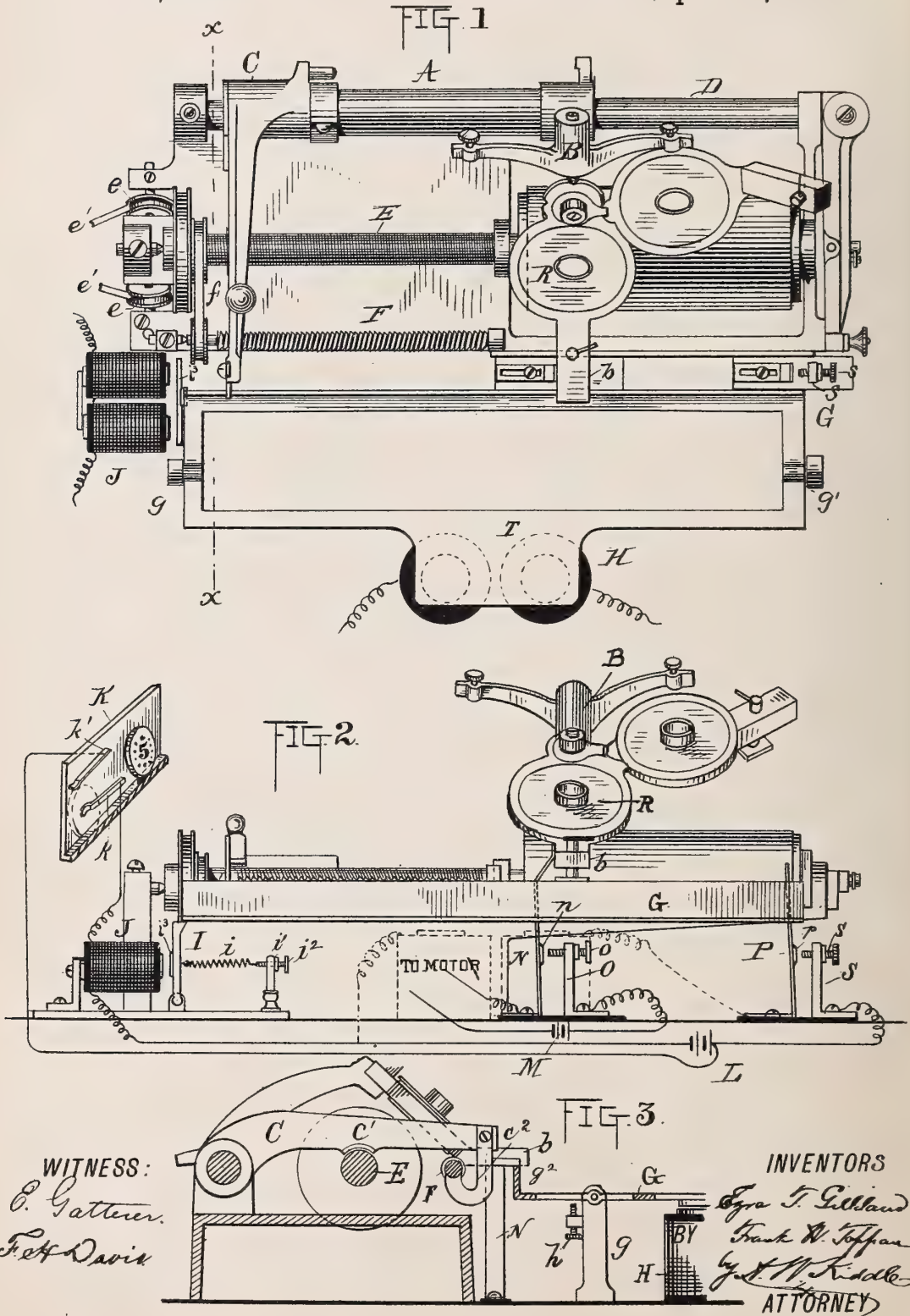
In presence of—

GEO. W. AYERS,

ALEX. MAHLEY.

(No Model.)

E. T. GILLILAND & F. W. TOPPAN.
ATTACHMENT FOR AUTOMATICALLY OPERATING PHONOGRAPHS.
No. 518,209. Patented Apr. 10, 1894.



UNITED STATES PATENT OFFICE.

EZRA T. GILLILAND AND FRANK W. TOPPAN, OF NEW YORK, N. Y.

ATTACHMENT FOR AUTOMATICALLY OPERATING PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 518,209, dated April 10, 1894.

Application filed March 6, 1890. Serial No. 342,875. (No model.)

To all whom it may concern,

Be it known that we, EZRA T. GILLILAND and FRANK W. TOPPAN, of New York city, in the county and State of New York, have invented certain new and useful Improvements in Attachments for Automatically Operating Phonographs, of which the following is a specification.

The object of our invention is to enable phonographs and similar talking machines to be operated automatically, and by means of which the phonograph is adapted to be thrown into operation by the insertion of a piece of money, thereby enabling it to be used after the manner of what are known as vending machines, the coin in its passage closing an electric circuit which, as will be hereinafter explained, starts the phonograph.

We will show and describe our invention as applied to that kind of phonograph which is provided with a left-handed screw of high pitch for moving the spectacle carrying the reproducer of the phonograph backward or returning it to its starting point, after it has finished talking, for the purpose of repeating, although we do not mean to limit our invention to its use with the class of machines shown and described, but we use the word "phonograph" throughout this specification and the claims hereof as a generic term and intend thereby to include all talking machines such as the graphophone and the phonograph-phonophone.

In the accompanying drawings forming a part hereof—Figure 1 is a top view of a phonograph of the class mentioned and of the automatically operating means or mechanism embodying our invention connected therewith. Fig. 2 is a side view in elevation of the means or mechanism embodying our invention; and Fig. 3 is an end view taken through line X—X of Fig. 1.

The phonograph is shown in Fig. 1, and the sleeve A thereof, carrying the spectacle B and the arm C, slides or moves from right to left on the cross-bar or rod D.

E is the right-handed screw-threaded shaft which is connected with the motor or other device that drives the phonograph, and this shaft carries the phonogram on which the

record is registered, so that both revolve together; the spectacle B is moved along in one direction when the phonograph is talking by means of this shaft, since the arm C engages with it and while the shaft E revolves the spectacle B is caused to travel in one direction on the cross bar D.

F is the left-handed screw-threaded shaft which returns the spectacle to its original position after the phonograph has finished talking and with which shaft the arm C is also adapted to engage.

The construction and shape of the arm C is shown in Fig. 3, that is, it is screw-threaded at c' on its under side and this screw-threaded portion meshes with the shaft E to move the spectacle B in one direction, that is, so that the phonograph may operate or talk; but, of course, as will be readily understood, the arm C is not at the same time in contact with the shaft F which, as before stated, is for the purpose of returning the spectacle to its starting point, although these shafts revolve together, being connected by the belt f .

In order to move the spectacle backward the reproducing point must be raised from off the phonogram so as not to destroy the record registered upon it, and the arm C must also be raised from contact with the shaft E, and this raising of the arm C causes it to come in contact with the under side of the shaft F and to be returned thereby, that is, by means of the downwardly projecting curved plate c^2 connected with the outer end of the arm C (see Fig. 3), which plate is in the form of a knife edge on its upper edge and engages with the shaft F on its under side, which in revolving forces back the spectacle B, since this plate c^2 will be made to travel, as it were, in the thread of the shaft F. Thus, when the arm C is down, as also the spectacle in position for talking, it rests upon the shaft E to be moved along thereby, but the plate c^2 is not then in contact with the under side of the shaft F, but is down below it; when the arm C is up, as also the spectacle, the plate c^2 will then be in contact with the under side of the shaft F and be moved backward thereby as explained. This raising and lowering of the spectacle has been

done heretofore by the operator, but it is part of our invention to accomplish this by means of electro-magnets.

G is a rocking-bar hung or pivoted on the posts g g' and the inner side of this rocking-bar has a projection g^2 extending its entire length, upon which rests an arm or projection b forming part of the reproducer R; the outer side of this rocking-bar carries a projection T which is adapted to be operated upon by electro-magnets H.

To prevent the inner side of the rocking-bar from falling too far and thereby raising the outer side out of reach of, or to too great a distance to be operated upon by the magnet H a screw h or stop is connected with one of the posts g upon which the rocking bar rests or is pivoted and against which stop the bar G strikes in falling and is thereby prevented from dropping too far.

I is a bar pivoted at its bottom to the attachment and upon which bar the inner side of the rocking-bar G rests when the machine is not talking, thereby holding up that side of the rocking-bar G and also holding up the spectacle B and reproducer R, forming part of it, from contact with the phonogram, since the projection b of the reproducer R is in direct contact with this inner side of the rocking-bar G, and when this side of the rocking-bar G is up it holds the reproducer R up, as will be readily understood.

To one side of the bar I is attached a spring i , the other end of which spring being connected with a post i' or directly to a screw i^2 which passes through the post i' for the purpose of regulating the tension of this spring, and this tension is to the right, as shown in the drawings, and against the power of an electro-magnet J which in its active condition operates upon the bar I through the armature i^3 thereon.

K is a portion of the box or receptacle into which the piece of money is dropped, and this coin travels on an incline, as shown, and if of the proper size comes in contact with both the metal contacts k k' which are in circuit with the magnet J and a battery L, and this circuit remains normally broken at the point between the contacts k k' but is closed for a moment by the coin which in its passage touches both contacts, thereby closing the circuit to the battery L and magnet J, energizing this magnet which will then attract the armature i^3 on the bar I, drawing it to the left, as shown in the drawings, from under the rocking-bar G thereby enabling the inside edge of this rocking-bar to fall and with it the spectacle, lowering the reproducer R into position on the phonogram for talking; but this is only for an instant, since the coin only closes the circuit to the battery L and the magnet J in passing between the contacts k k' and as soon as it is gone by them the circuit is again broken and the magnet J de-energized; but the bar I cannot be drawn to the right again by the spring i , since the inner

edge of the rocking-bar G is down, and against the end of this rocking-bar the bar I rests until the rocking-bar is subsequently raised as will be presently explained. Almost at the same moment that the rocking-bar G has stopped or is down and the reproducer is in position for talking, the phonograph will begin to operate, since the rocking-bar or the spectacle in lowering has closed the circuit to the battery M and the motor (not shown) which drive the phonograph by means of a circuit-closing device which it operates and which we will now explain.

N is a strip of spring steel carrying an armature n and which is fastened at its lower end to the bottom of the attachment (see Fig. 2) and is insulated therefrom. The upper end of this spring is bent, as shown, and is in direct contact with the projection b of the reproducer R and is held back thereby from contact with a screw o .

O is a post also insulated from the base of the attachment and carries on its upper end an adjustable screw o with which the armature n on the spring N makes contact. The post O is in circuit with the battery M (or the motor circuit) from which battery the current runs to the motor that drives the phonograph, and the spring N is also in this same circuit, the circuit being from the battery M to the motor, from the motor to the spring N, and when the armature n is in contact with the screw o to the post O and back to the battery. A similar circuit-closing device consisting of the spring P carrying an armature p is also connected with the base of the attachment and insulated therefrom, and there is also located near this spring a post S also attached to but insulated from the base of the attachment, through which post passes an adjustable screw s which is adapted to come in contact with the armature p on the spring P and close an electric circuit which runs from the battery L to the magnets H and therefrom to the spring P to the post S and back again to the battery.

To return now to the point where the coin in passing between the contacts k k' has closed the circuit from the battery L to the magnet J to trip the bar I and lower the inner edge of the rocking-bar G and with it the spectacle and reproducer into position for talking, the arm C will then rest upon the screw-threaded shaft E which is connected with the motor by the pulleys e and belts e' ; and in falling the projection b on the reproducer R drops below the inwardly extending upper end of the spring N which thereby is enabled to move or moves itself to the right, and comes in contact with the screw o on the post O, thereby closing the circuit from the battery M to the motor which begins to run, revolving the shaft E, carrying along the arm C; and the phonograph will begin to operate or to talk and continue to talk until the spectacle strikes the spring P, which is made adjustable to the right or to the left accord-

ing as to how much of the record registered upon the phonogram is desired shall be heard, forcing it in contact with the screw *s* on the post *S*, thereby closing the circuit to the battery *L* and the magnets *H*, which are thereby energized and attract or draw down the projection *T* on the opposite or other edge of the rocking-bar *G*, lowering that side of the rocking-bar and raising the inner side of the rocking-bar and with it the reproducer from contact with the phonogram, and the phonograph has ceased to talk; at the same moment the rod *I* is drawn into position by the spring *i* under the rocking-bar *G* and holds it there in position until it is drawn away again by the subsequent insertion of another coin, which closes the circuit to the battery *L* and magnet *J*, as before explained. But the motor has not stopped, since the circuit is still closed from the battery *M* to the motor because the armature *n* on the spring *N* is still in contact with the screw *o* on the post *O*, for, although the phonograph has ceased talking, the spectacle and reproducer must be returned to their original position; and this is accomplished by the screw-threaded shaft *F* which has also been revolving with the screw-threaded shaft *E*, being connected therewith by the belt *f*; but, as will be readily understood, and as before explained, when the spectacle has been raised by the rocking-bar *G* it has also raised the arm *C* from off the shaft *E*, and at the same time lifted the plate *c*² in contact with the under side of the shaft *F*, which is screw-threaded in the opposite direction from the shaft *E* for the purpose of returning the spectacle. As soon as the spectacle has commenced to return the spring *P* is thereby removed from the screw *s* and the circuit from the battery *L* to the magnets *H* is then broken, for those magnets have finished their work having drawn down one side of the rocking-bar *G* and at the same time lifted up the spectacle; and when the projections *b* on the reproducer *R* of the spectacle has reached in its backward travel the inwardly extending end of the spring *N* it forces it back, removing the armature *n* from contact with the screw *o* on the post *O* and thereby breaks the circuit from the battery *M* to the motor which then ceases to run and stops the phonograph, and all the parts are once more in position ready for the insertion of another coin. Thus, as will be seen, there are three circuits: one (which is closed by the passage of the coin) from the battery *L* to the magnet *J* and back to the battery *L* for the purpose of tripping the rod *I* to lower the spectacle; another running from the battery *M* to the motor that drives the phonograph, therefrom to the spring *N*, post *O* and back to the battery *M*; and another which runs from the battery *L* to the magnets *H* and therefrom to the spring *P* and post *S* and back to the battery *L* for the purpose of raising the spectacle to stop the talking and enable the spectacle to be returned. Thus it

will be seen that, by our invention, instead of the spectacle being controlled and operated by the operator, it is controlled and operated by an electromagnet, that is, instead of being raised and lowered by the operator, it is raised and lowered by an electro-magnet.

Heretofore the rocking-bar has been a part of the phonograph and was capable of taking three positions through the medium of a cam: when lowered, the reproducer was brought in contact with the phonogram into position ready for talking; when raised one half of the distance of which it is capable of moving the reproducer, was raised from off the phonogram and the arm *C* raised out of the thread of the shaft *E* suspending the talking; and when it was desired to repeat or go backward, the arm was raised to the highest point which brought the left-handed or reverse screw *F* into action. In our invention, the rocking-bar is capable of taking only two positions; but this, however, serves the purpose of our invention, since we only require two positions of the phonograph spectacle and the arm *C*, that is, the spectacle should either be down in position for talking, or up bringing into action the reverse motion for returning it to the starting point.

As will be readily understood, to enable the phonograph or other similar talking machines to be operated automatically, there are four actions or operations which must be produced at the proper times: first, the lowering of the spectacle arm to bring the reproducer into position for talking; second, the closing of the circuit to the motor; third, raising the spectacle so that it may be returned to its starting point after the phonograph has produced the desired amount of talking; and fourth, opening the motor circuit to stop the phonograph. These operations being the objects of our invention to accomplish, we have shown and described a mechanism or means embodying our invention which effectually accomplishes these desired results.

A dash-pot or other similar device may be attached to the rocking-bar or lifting arm to prevent a jar when the bar is dropped and prevent injury to the phonogram or a disturbance of the attachment of the reproducer; and we may also attach to the spectacle arm a counter-balance in order that the electromagnets operating the lifting device may raise the arm without difficulty, this counter-balance also preventing the jar produced by the lowering of the spectacle arm.

The circuit-closing devices which close the circuits, before and for the purposes set forth, are adjustable in respect to the point at which they are brought into action in order to start or stop the phonograph at any point on the phonogram according as to how much of the record registered upon it is desired shall be heard; and while the circuit closing devices shown and described are effectual for the purposes desired yet we do not intend to limit our invention to the use of these par-

ticular circuit closing devices since there are many circuit closing devices which could be employed for the purposes desired, the use of any of which would be covered by our invention.

The circuit operating the starting device or rocking-bar can be arranged to be closed by the spectacle when traveling in the reverse or return motion at any point in its backward travel by means of an adjustable circuit-closing device to lower the spectacle into position for talking, so as to automatically repeat the talking as often as desired without the insertion of another coin, as will be readily understood.

Although we prefer to use a supplementary battery L for connecting or operating the rocking-bar through the medium of the electro-magnets J and H, but as each of these magnets call upon the battery to act for an instant only, we can utilize the phonograph or motor battery for these purposes without the supplementary battery if desired.

What we claim as our invention is—

1. The combination, with a phonograph and an electric circuit which supplies power to operate said phonograph, of an attachment or device to hold the spectacle and reproducer from contact with the phonogram when the phonograph is not talking, an electro-magnet in a circuit adapted to operate on said device or attachment to lower the spectacle and reproducer into position for talking, and a coin to close the circuit to the source of electric energy and said magnet, substantially as and for the purpose set forth.

2. The combination, with a phonograph and an electric circuit which supplies power to operate said phonograph, of an attachment or device to hold the spectacle and reproducer from contact with the phonogram when the phonograph is not talking, an electro-magnet in a circuit adapted to operate on said device or attachment to lower the spectacle and reproducer into position for talking a coin to close the circuit to the source of electric energy and said magnet and another electro-magnet in a circuit which is also adapted to operate on said device to raise said spectacle and reproducer at any desired point in their travel according as to how much of the record registered on the phonogram it is desired shall be heard, substantially as and for the purpose set forth.

3. The combination with a phonograph and an electric circuit which supplies power to operate said phonograph, of an attachment or device to hold the spectacle and reproducer from contact with the phonogram when the phonograph is not talking, an electric circuit from a separate source of electric energy, an electro-magnet in circuit with said separate source of electric energy adapted to operate on said attachment or device to lower the spectacle and reproducer into position for talking and at the same time close the said motor circuit so that the phonograph may operate or talk, and a coin to close the circuit

to said separate source of electric energy, substantially as and for the purpose set forth.

4. The combination with a phonograph and an electric circuit which supplies power to operate said phonograph, an attachment or device to hold the spectacle and reproducer from contact with the phonogram when the phonograph is not talking, an electric circuit from a separate source of electric energy, an electro-magnet in circuit with said separate source of electric energy adapted to operate on said attachment or device to lower the spectacle and reproducer into position for talking and at the same time close the said motor circuit so that the phonograph may operate or talk, and a coin to close the circuit to said separate source of electric energy, and another electro-magnet in circuit with said separate source of electric energy which is also adapted to operate on said attachment or device to raise the spectacle and reproducer at any desired point in their travel according as to how much of the record registered on the phonogram it is desired shall be heard, substantially as and for the purpose set forth.

5. The combination with a phonograph driven by a motor, of an attachment to normally hold the spectacle and reproducer from contact with the phonogram, an electro magnet to operate on said attachment to lower the spectacle and reproducer into position for talking, the electrical circuit operating said magnet being normally open and being closed by a coin, an adjustable circuit closing device which is operated by the spectacle and reproducer in lowering to close the circuit to the motor, and is operated by the spectacle and reproducer in returning to its normal condition to open the said circuit, an electro magnet operating on said attachment to raise the spectacle and reproducer, and an adjustable circuit closing device which is included in the circuit with the last named electro magnet and is actuated by the spectacle and reproducer at any desired point in their forward travel, substantially as described.

6. The combination with a phonograph of an attachment or device to normally hold the spectacle and reproducer from contact with the phonogram, an electro-magnet adapted to operate on said device or attachment to lower the reproducer into position for talking, and at the same time to close the circuit to the motor that drives the phonograph, the electric circuit operating said magnet being normally open and adapted to be closed by means of a coin, and an electro-magnet which also operates on said attachment or device to raise the spectacle and reproducer at any desired point in its travel, according as to how much of the record on the phonogram it is desired shall be heard, substantially as and for the purpose set forth.

7. The combination with a phonograph of an attachment or device to normally hold the spectacle and reproducer from contact with the phonogram, said attachment or device be-

ing adapted to be operated upon by an electro-magnet to lower the reproducer into position for talking and at the same time to close the circuit to the motor that drives the phonograph, the electric circuit operating said magnet being normally open and adapted to be closed by means of a coin and an electro-magnet which also operates on said attachment or device to raise the spectacle and reproducer at any desired point in its travel, according as to how much of the record on the phonogram it is desired shall be heard, so that it may be returned to its starting point, and an adjustable circuit-closing device adapted to be operated at any desired point of the return of the phonograph to open the motor circuit and stop the phonograph, substantially as and for the purpose set forth.

8. The combination with a phonograph of an attachment or device to normally hold the spectacle and reproducer from contact with the phonogram when the phonograph is not talking an electro-magnet adapted to operate on said attachment or device to lower the spectacle and reproducer, and at the same time to close the circuit to the motor that drives the phonograph, the electric circuit operating said magnet being normally open and adapted to be closed by means of a coin, substantially as and for the purpose set forth.

9. The combination, with a phonograph driven by an electric motor, of an electrically operated attachment for raising and lowering the spectacle and reproducer, an electro magnet operating on said attachment to release and lower it and to thereby lower the spectacle and reproducer and simultaneously close the motor circuit, the circuit of the said motor being normally open and being closed by a coin, an electro magnet operating on said attachment to raise the reproducer and spectacle, an adjustable circuit closing device which is included in circuit with the last named electro magnet, and is actuated by the spectacle and reproducer at any desired point in their forward travel, and an adjustable circuit breaking device operated at any desired point of the rearward travel of the

spectacle and reproducer to open the motor circuit, substantially as described.

10. The combination with a phonograph, the reproducer thereof having a projection *b*, of the rocking-bar *G*, bar *I*, the adjustable spring *i*, electro-magnet *J*, battery *L* and contacts *k k'* in circuit with said battery *L* and magnet *J*, all constructed, arranged and adapted to operate by means of a coin, substantially as and for the purpose herein described.

11. The combination with a phonograph, the reproducer thereof having a projection *b*, of the rocking-bar *G*, bar *I*, the adjustable spring *i*, electro-magnet *J*, battery *L*, contacts *k k'* in circuit with said battery *L* and magnet *J*, the adjustable circuit-closing device consisting of the spring *N*, post *O*, and screw *o*, battery *M* and an electric motor for driving said phonograph in circuit with said battery *M* and circuit-closing device, all constructed, arranged and adapted to be thrown into operation by means of a coin, substantially as and for the purpose herein described.

12. The combination with a phonograph, the reproducer thereof having a projection *b*, of the rocking-bar *G*, bar *I*, the adjustable spring *i*, electro-magnet *J*, battery *L*, contacts *k k'* in circuit with said battery *L* and magnet *J*, the adjustable circuit-closing device consisting of the spring *N*, post *O*, and screw *o*, battery *M*, and an electric motor for driving said phonograph in circuit with said battery *M* and circuit-closing device, and an adjustable circuit closing device consisting of the spring *P*, post *S* and screw *s* in circuit with the battery *L*, and magnet *H*, all constructed, arranged and adapted to operate, substantially as and for the purpose herein described.

This specification signed and witnessed this 1st day of February, 1890.

EZRA T. GILLILAND.
FRANK W. TOPPAN.

In presence of—

A. W. KIDDLE,
FREDERICK H. DAVIS.

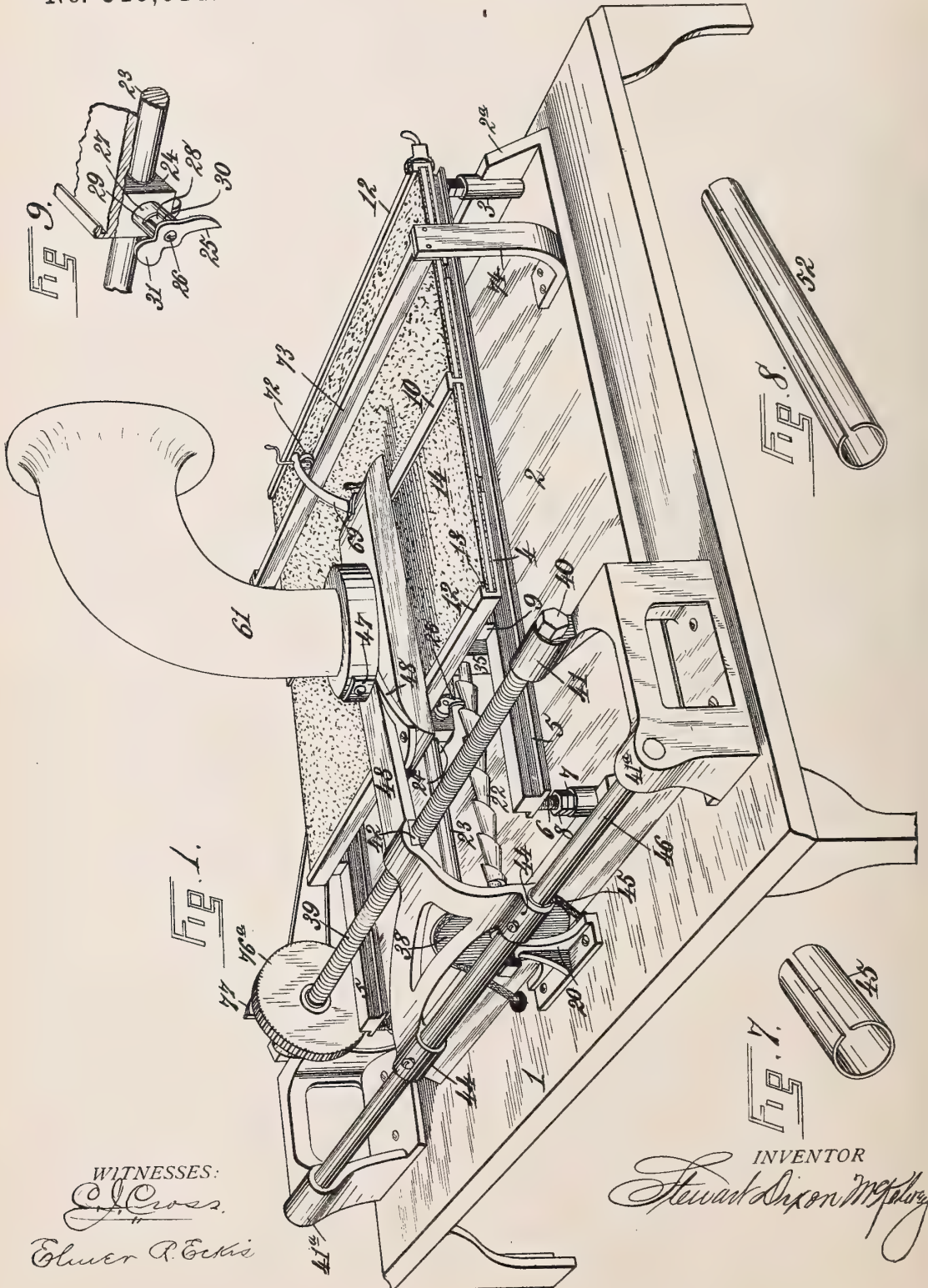
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5 Sheets—Sheet 1.

S. D. McKELVEY.
PHONOGRAPH.

No. 519,614.

Patented May 8, 1894.



WITNESSES:
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Elmer A. Eick

INVENTOR
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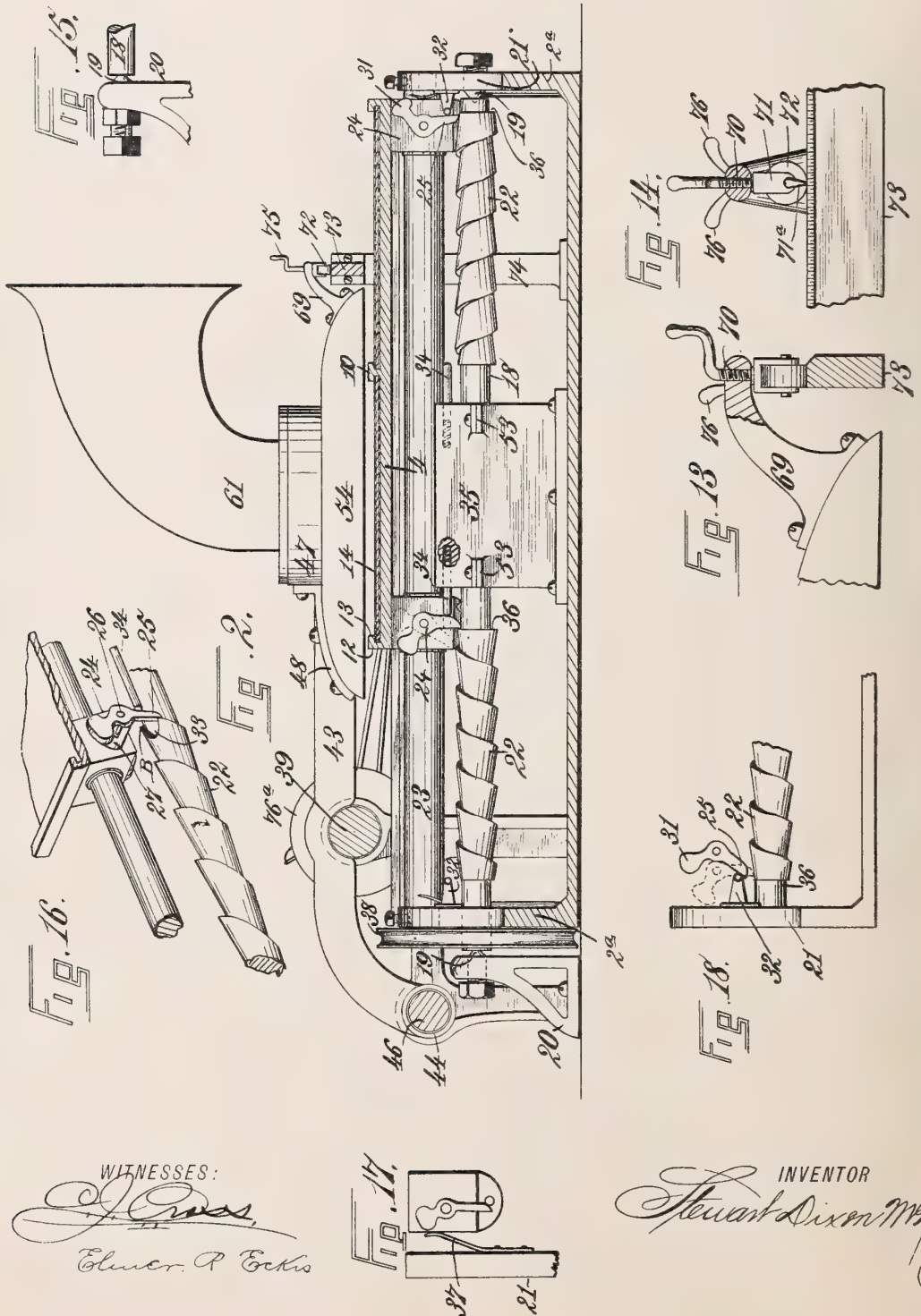
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5 Sheets—Sheet 2.

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(No Model.)

5 Sheets—Sheet 3.

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No. 519,614.

Patented May 8, 1894.

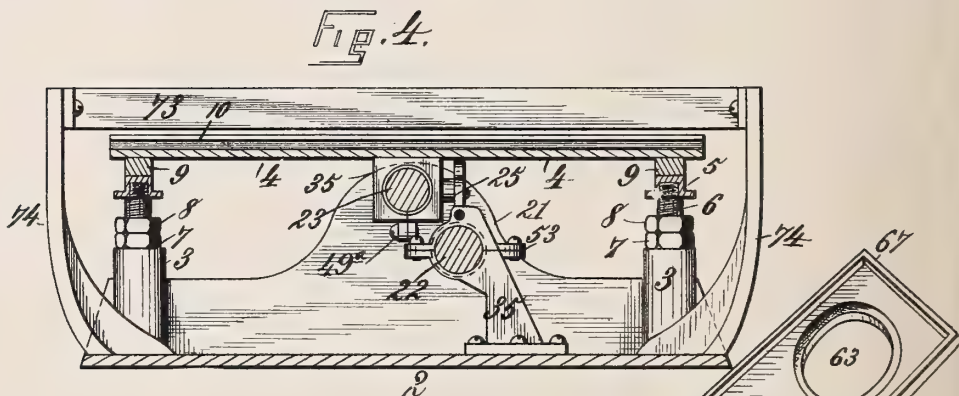
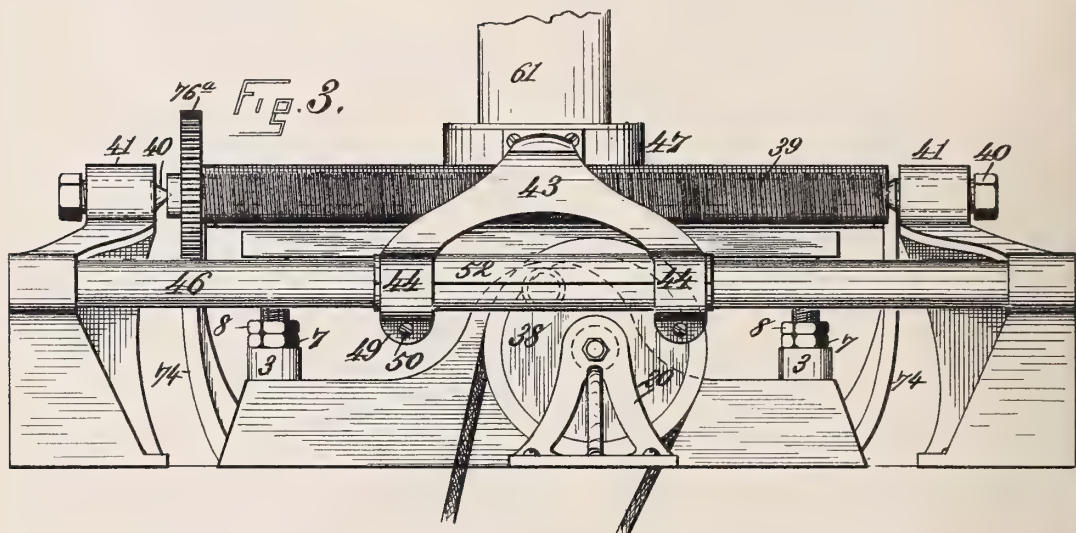


Fig. 12.

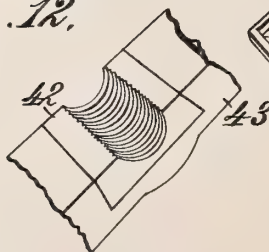
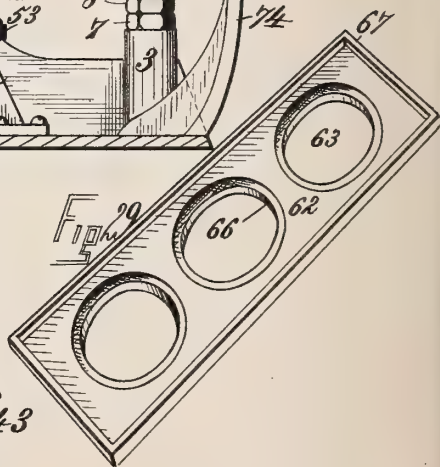


Fig. 20.



WITNESSES:
C. J. Cross
Charles R. Beck

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Stewart Dixon McKelvey

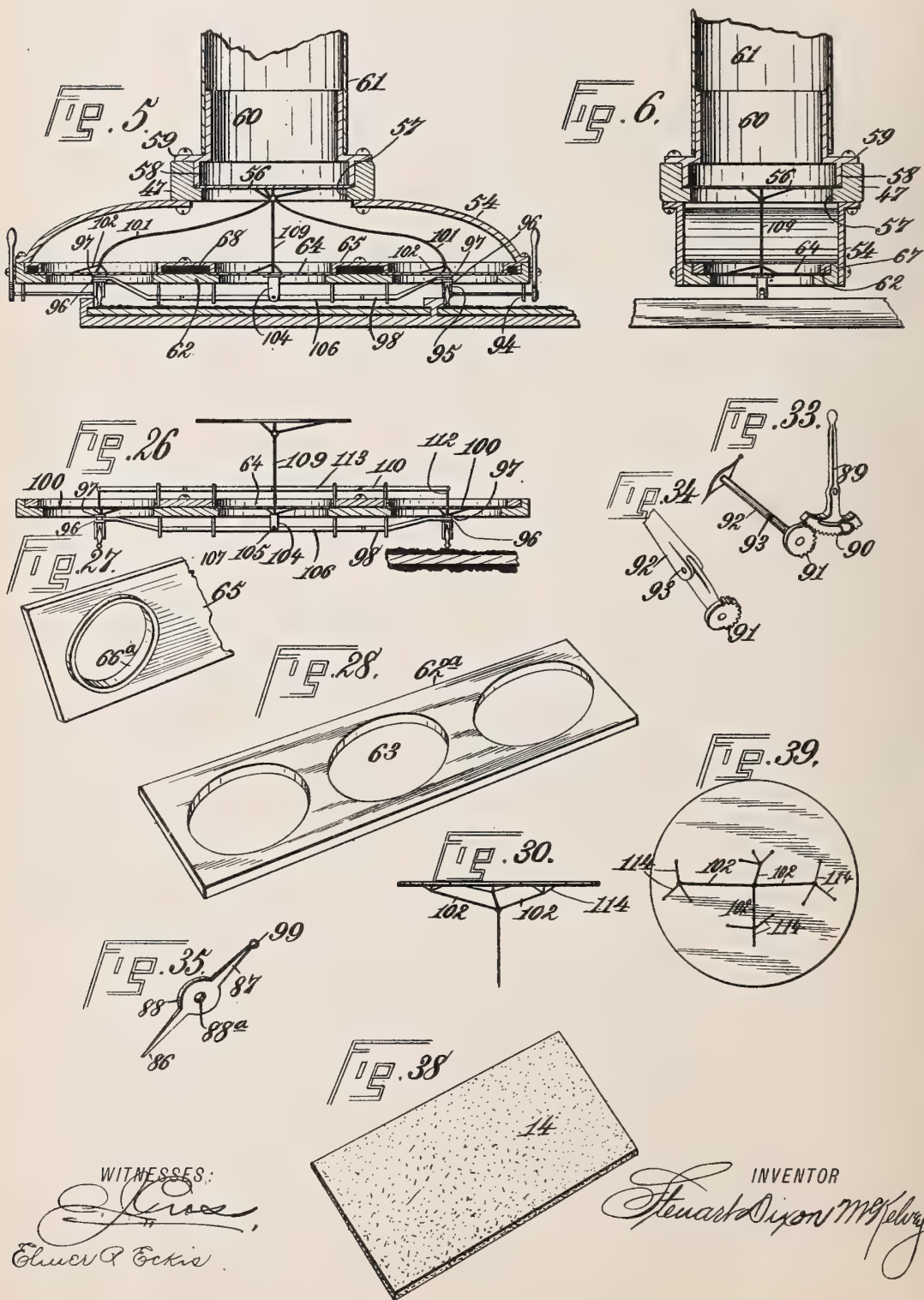
(No Model.)

5 Sheets—Sheet 4.

S. D. McKELVEY.
PHONOGRAPH.

No. 519,614.

Patented May 8, 1894.



WITNESSES:

Charles P. Eckis

INVENTOR

Stewart Dixon McKelvey

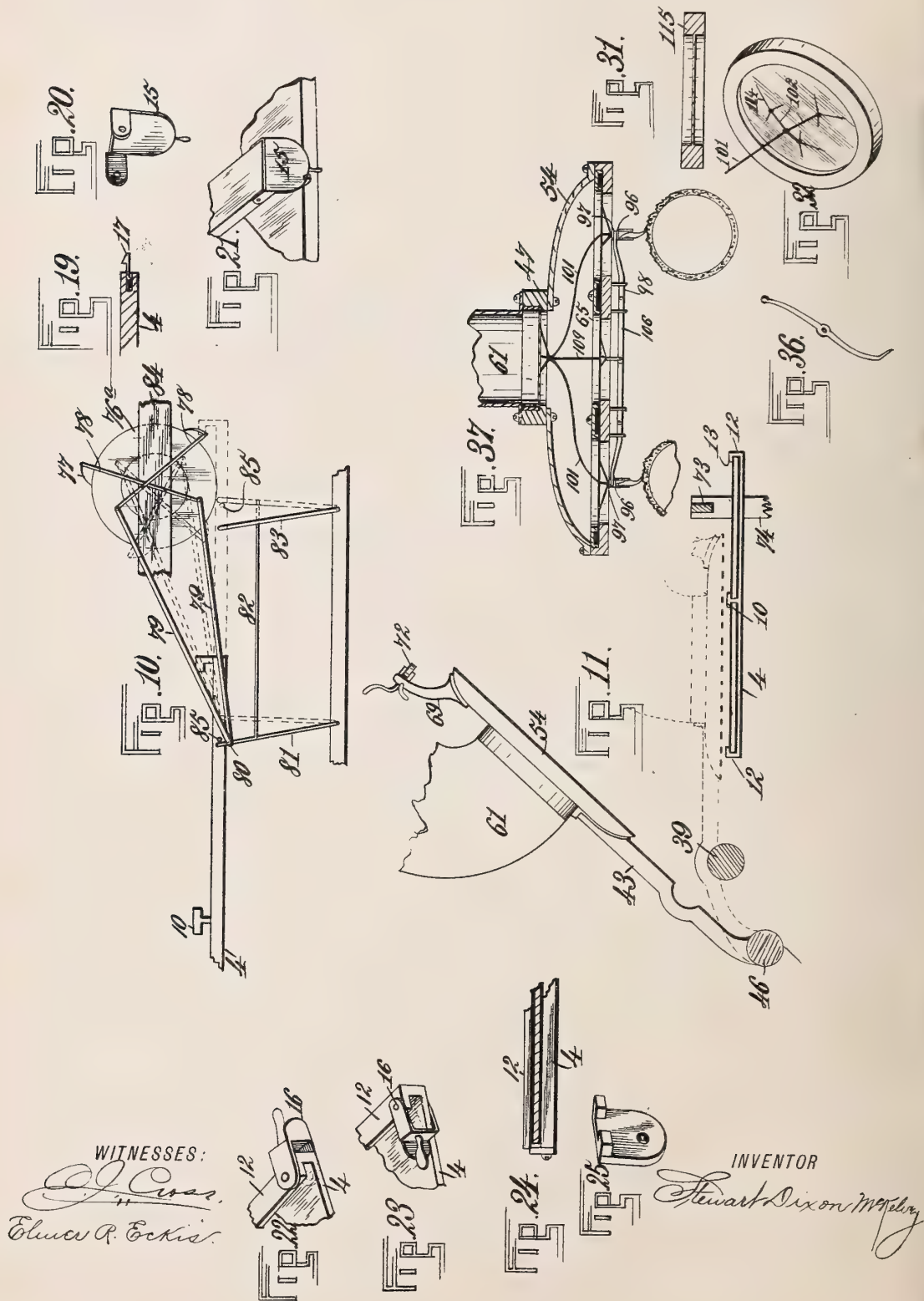
(No Model.)

S. D. McKELVEY.
PHONOGRAPH.

5 Sheets—Sheet 5.

No. 519,614.

Patented May 8, 1894.



UNITED STATES PATENT OFFICE.

STEWART DIXON McKELVEY, OF CANTON, OHIO, ASSIGNOR OF ONE-THIRD
TO JOSEPH A. LINVILLE, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 519,614, dated May 8, 1894.

Application filed November 5, 1891. Serial No. 411,001. (No model.)

To all whom it may concern:

Be it known that I, STEWART DIXON McKELVEY, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to certain improvements in phonographs, the purpose thereof being to make provision for the use of a flat surface for recording the sound vibrations, instead of the cylindrical form now in general use, and to enable a duplicate record to be formed at the same time and from the same vibrations, upon a separate surface, or tablet to serve as a retained copy of the matter recorded upon the tablet, which is mailed or otherwise used.

It is my purpose also, to provide means enabling a continuous and unbroken phonographic record to be made upon a flat tablet of suitable material; the path of the recorder being from side to side, or end to end of the tablet; to so actuate the feeding devices that the sharp turns of the recorder, at the rounded ends of the successive lines, shall be made in such a manner that the reproduction shall not be varied or impaired in any manner; to provide automatic means for feeding the tablet to give the line-space and for reciprocating said table beneath the recorder, or reproducer, and to enable a duplicate record to be made upon an independent tablet and by a separate, or secondary recorder, actuated by a separate diaphragm, but operating in unison with the main, or primary diaphragm.

It is further my purpose to provide novel devices for supporting the recorder and for transmitting the vibrations of the diaphragm thereto, and to provide simple means whereby two duplicate records may be made upon different surfaces, by a single primary diaphragm, and to provide for the adjustment of the recording or reproducing devices, with relation to the surface, or surfaces, upon which they operate.

It is one purpose of my invention to provide means whereby, as already set forth, double or duplicate records can be simultaneously produced upon, or reproduced from, independent surfaces, to provide a retained

copy in case one duplicate should be mailed to a correspondent, or otherwise pass out of the hands of the person making it.

It is also my object to provide for the employment of such duplicate records in the reproduction, and thereby materially increase the volume of sound.

It is my purpose, also, in this connection, to provide a construction and combination of parts whereby the position of either one of the recording instruments, or the reproducers may be adjusted as to the angle at which it acts, or removed entirely from action; to provide a novel method of connecting the said instruments to the diaphragms by which they are supported, whereby no two points of connection shall be in the same nodal circle, or line, and to connect the main phonetic diaphragm upon which the sound is concentrated, to the individual supporting diaphragms in such manner that the latter shall have more or less vibratory movement in unison with the main diaphragm.

It is one object of my invention, also, to obviate the false vibrations which are frequently produced in phonographs, and by reason of which crackling, or harsh grating, sounds of considerable strength are given by the reproducer.

I propose, moreover, to provide certain novel improvements in the construction of the recording and in the reproducing instruments, or needles, whereby rapid wear and deterioration from often repeated use of the recorders in reproducing is avoided.

It is my object, also, to improve the diaphragm, to render it more sensitive, and to provide simple and novel means for supporting and holding the composition upon which the record is made, either singly, or in duplicate.

The invention consists, to these ends, in the several novel features of construction and new combinations of parts hereinafter fully set forth, and then more particularly pointed out and defined in the claims following this specification.

To enable others skilled in the art to which my invention pertains, to make, construct and use the same, I will proceed to describe my invention in detail, reference being had for that

purpose to the accompanying drawings, in which—

Figure 1, is a perspective view, showing the complete mechanism, save only the motor, or other actuating device. Fig. 2, is a transverse vertical section of the parts shown in Fig. 1, taken a little to the side of concentrator. Fig. 3, is a rear elevation of the parts shown in Fig. 1, the concentrator being partly broken away. Fig. 4, is a vertical section, taken longitudinally a little in front of the guide rail, or track 73, Fig. 1. Fig. 5, is a vertical section taken centrally through the concentrator and through the diaphragm chamber beneath. Fig. 6, is a vertical section of Fig. 5, the section plane being at right angles with the line of section in Fig. 5. Figs. 7 and 8, are detail perspective views showing the metallic, or fiber sleeves, for taking up the wear. Fig. 9, is a detail perspective, showing the automatic feed-dog which engages with the double threaded shaft for imparting a reciprocating motion, or transverse feed, to the platform carrying the recording tablets. Fig. 10, is a detail end elevation, showing the mechanism by which the line-feed is effected. Fig. 11, is a detail vertical section, showing the manner of connecting the sound-conveyer and concentrator and diaphragm chamber, and engaging the same with the threaded shaft, imparting a periodical line-feed. Fig. 12, is a detail perspective, showing part of the carrier and the threaded pillow-block set therein to rest upon the shaft giving the line-feed. Fig. 13, is a detail section, showing the means for adjusting the position of the stylus relatively to the surface upon which it operates. Fig. 14, is a detail section, showing the same parts, and the front edge of the graduated guide bar or track. Fig. 15, is a detail elevation, showing one of the adjustable end bearings for the feed shafts. Fig. 16, is a detail perspective, showing parts of the shaft by which the transverse feed is effected, with the feed-pawl and part of the platform. Fig. 17, is a detail view, showing the action of the feed-pawl, and one of the springs for facilitating the return-feed of the platform, and preventing all shock or jar to the reverse movement of the table. Fig. 18, is a detail view, showing the action of the feed-pawl, or dog, in reversing the feed of the platform. Fig. 19, is a detail view, showing the edge of the platform and the latch holding one of the pivoted stops, by which the tablet is arrested, when introduced to proper position. Fig. 20, is a detail perspective, showing one of the pivoted stops. Fig. 21, is a detail perspective, showing the stop (Fig. 20), mounted and engaged with the latch shown in Fig. 19. Fig. 22, is a detail perspective, showing one of the pivoted detents for securing the tablet and preventing longitudinal displacement after said tablet is placed upon the platform. Fig. 23, is a detail perspective, showing the detent illustrated in Fig. 22, closed. Fig. 24, is a detail

section of a part of the platform, showing one of the tablets in place with the stop closed. Fig. 25, is a perspective view of one of the stops shown in Fig. 24. Fig. 26, is a view in vertical section, showing the main diaphragm, and the auxiliary, or secondary diaphragms, the connections between the same, the styles, the devices intermediate between the styles and the diaphragms, and part of one of the tablets. Fig. 27, is a partial perspective, showing the construction of the under part of the support for the auxiliary or secondary diaphragms. Fig. 28, is a detail perspective of the upper part of the said diaphragm support. Fig. 29, is a detail perspective, showing the construction of the upper surface of the lower plate, and in which the secondary or auxiliary diaphragms are supported. The under surface of said plate is flat, the same as the upper surface of plate as shown in Fig. 28. Fig. 30, is an edge elevation of the parts shown in Fig. 39. Fig. 31, is a central section of a diaphragm and its supporting frame, showing the preferred construction. Fig. 32, is a detail perspective, showing a diaphragm and its frame, and illustrating manner of attaching the stylus connections. Fig. 33, is a detail perspective, showing one of the duplex recording and reproducing styles, with the reversing devices. Fig. 34, is a detail view upon a somewhat enlarged scale of part of the stylus-supporting-lever shown in Fig. 33. Fig. 35, is a detail perspective upon an enlarged scale, of the style shown in Fig. 33, detached from its lever or support. Fig. 36, is a detail perspective showing a modification of the stylus shown in Fig. 35, when used on cylindrical tablets as shown in Fig. 37. Fig. 37, is a sectional view, showing a slight modification, adapting the duplex recording and reproducing devices to a cylindrical tablet. Fig. 38, is a perspective view of one of the preferred flat tablets. Fig. 39, is a face view of one of the diaphragms, showing one method of connecting between different nodal circles.

The reference numeral 1, in said drawings indicates the supporting frame of the machine, which consists, essentially, of a rectangular base-plate, raised, if desired, upon legs. The construction of the frame is not necessarily of importance in practicing the invention and may be widely varied. I will, therefore, in referring to this part, be understood as comprehending any preferred form of construction, and the use of any desired material therein.

Upon the base-plate 1 is usually placed a somewhat smaller table 2, from which rise posts 3, to sustain the rails traversed by the reciprocating platform, or carriage 4, which supports and retains the tablets on which record is to be made, or from which recorded matter is to be reproduced. The rails consist of bars 5, of suitable material, having in cross section the form, approximately, of a letter T inverted. They are supported at or near their ends upon the posts 3, by means of

threaded pins 6, having their reduced upper ends tapped, or swiveled into the lower faces of the rails, while the other ends of said pins enter threaded apertures in the tops of the posts and rest upon nuts 7, which are held in place by jam-nuts 8. This construction permits a delicate and accurate adjustment of the platform at each of its four corners separately.

The carriage 4 consists of a perfectly flat, rectangular plate, provided with slide-blocks, or ribs 9, which may extend from side to side of its lower face and serve as stiffening ribs. These bars, or blocks, rest and slide upon flat upper surfaces of the rails 5. This arrangement is capable of modification, and I do not wish to be limited as to construction, as I have found by placing a journaled traveler at or near the four corners of the table, similar to one shown by reference to 71 and 72, (Fig. 14) and placed so that the traveler shall rest upon the guide bars 5, that the friction is considerably reduced. These travelers may be constructed so as to roll in either direction upon the guide bars, and may be supported by suitable brackets, attached to the under surface of table 4.

The carriage is of such size as to provide two similar spaces, divided from each other by a T flange 10, rising from the surface and extending from end to end, the outer edges parallel with said flange, being provided with flanges 12, having overhanging ribs 13, and the corresponding rib on the central or dividing flange 10. Each space is preferably of the same length and width as the tablet to be inserted, so that the ends of the latter are flush with the ends of the carriage. To make the specification more clear, it should be here noted that the concentrator 61, faces the front of the machine as shown in Figs. 1 and 2. The tablets 14 are pushed into place and their ends are arrested or butted against suitable stops, which may be of form shown in Figs. 24 and 25. It is preferable that the stops on either end of the table do not project across the slotted openings in table 4, so that dust or shavings from tablet 14, may be easily removed. The ends of the tablets on the left or entering end of the table are held in place by suitable stops (Figs. 21, 22 and 23), pivotally mounted upon the angles 10 and 12 of table.

The table or carriage is moved by means of a threaded shaft 18, arranged centrally, or substantially so, beneath and transverse to the length of the tablet-spaces, so that the lines of record will cross the tablet. It will be noted that the same principles will be evolved in making record lines longitudinally on the tablet, or end to end. Shaft 18 is supported at its ends in cone-bearings 19, one of which is adjustable in a bracket 20, the other being tapped through a riser 21. Upon said shaft are formed worm-threads 22, both of which may be left, or right-hand threads, formed by cutting one first and then turning

the shaft end for end, and cutting the other. Each of these threads is of such extent as to feed the carriage the length of a record line. The carriage or table is guided and its movement, rendered perfectly rectilinear by a rod or bar 23, supported at its ends by the riser 21, and by a similar support at the opposite end of shaft (Figs. 1, 2 and 4). The said bar is rigidly held in place by means of cap screws (Fig. 2). Embracing said bar or boxes 24, depending from the carriage and having suitable bushings 45 (Fig. 7) to take up the frictional wear.

Upon each of the boxes 24, is pivoted a dog 25, its pivotal support being afforded by a stud or pin 26, tapped into a lateral boss 27, which projects from the boxes, the outer ends of said bosses giving lateral support to the dogs against the side-thrusts of the worm-threads 22. In the surface of the boss 27, is formed a recess 28, in which lies a pin or lug 29, the latter being rigid with the dog, and adapted to move freely between the shoulders 30, at the ends of said recess, (see Fig. 9) said shoulders serving as stops to limit the swinging movement of the dog, and one of them being in such position as to maintain it rigidly in substantially the position shown in Fig. 2 in full lines, its point being in engagement with the worm-threads. Above its point of pivotal support, the dog is extended to form a shank or arm 31, which is enlarged at its end to increase its weight. This shank or arm is inclined at such an angle to the portion below the pivot pin, that when it is thrown backward and when the working end or point of the feed-dog is raised out of operative engagement with the worm-thread, it will be maintained in such position by the gravity of its weighted arm, as seen in dotted lines in Fig. 2. The form of construction of this feed-pawl or dog is capable of modification, and I may substitute for the pin 29, working in recess 28, two pins, set in the side of box 24, above the pivotal point of support, to limit the swing of the feed-dog or pawl, to accomplish the same movements as already described and shown in Fig. 9. The shaft 18, is driven continuously by any suitable power, such as an electric motor, a foot treadle, a spring actuated train of gears, or other suitable means.

The feed-dogs are brought into operative engagement with its worm-thread 22, by being automatically dropped by contact with the adjustable bracket arms 32, projecting from the risers 21, as shown more fully in Fig. 2. The engaging or lower portion of the dog is brought against said arm by the feed movements of the carriage, an instant prior to the reversing of said movement. The engagement of the lower end of the feed-dog with the worm-thread, is provided for by the formation of the adjustable bracket-arm 32, which may be so adjusted that the engaging point of the feed-pawl will drop into position just an instant before the end of the thread engages with said pawl. The feed-dogs may

be alternately tripped out of engagement with the worm-thread 22, by means of tripping bars 34, or by a leaf spring hereinafter described. The ends of the tripping bars 34, as seen in Fig. 2, are let into the opposite lateral faces of the pillow bearings 35, and are held in place by small spiral-springs which are attached to the inner end of the tripping bars. The displacement of the tripping bars is prevented by a pin set through the pillow bearing cap, and the point of the pin working in an elongated slot, or between two shoulders as the construction of said bars may be preferred. I may also substitute for the spring-actuated arm or tripping bars 34, in pillow bearing 35, which supports the intermediate portions of the shaft 18, a leaf spring so adjusted that the pressure of the point of the spring shall be on the back edge of the pawl 25. The tension of the spring may be regulated by being wrapped around a small pin in the lower part of the box 24, and with the end resting against the under surface of the table. It will be readily seen that there are several forms of construction to accomplish the same movements with reference to the operation of the feed-pawl, and I do not want to be limited to specific forms of construction, as I have found in experiments that either construction previously described, will give the same satisfactory results. It should be noted however, that in either of the constructions, the pin or pins limiting the swing of the pawl should be covered with rubber tape or tubing, to deaden the clicking sound caused by the rapid action of the feed-pawls. The outer ends of these tripping bars project so as to abut that portion of each dog lying below its pivotal support, as seen in Figs. 2 and 16. It will be noticed from these figures that the final convolutions of the worm-threads pass into, or terminate in a circumferential shoulder 36, which lies at right angles with the shaft 18. The recesses 33 are formed at, or near the point where the said convolutions are merged into these shoulders, at which moment the carriage is at its extreme limit of movement. As this limit is reached the advancing edge of the carriage has been pressed against a leaf spring 37, and places the latter under tension as is seen in Fig. 17 and also in Fig. 2. The recoil of this spring, one of which is mounted on each of the risers 21, aids in overcoming the inertia and in imparting the initial reverse movement of the carriage. It also assists in steadying the movements and preventing all shock or jar by sudden reverse movements.

It should be noted that one end of the shaft 18, is carried through the riser 21, and caused to project on its opposite side, to receive the pulley 38, which is belted to the source of power. Both the risers 21, are formed by side pieces 2^a of the table 2, and the cone bearing 19, supporting the projecting end of the shaft, has support in bracket 20, which is mounted on the main frame of the machine. This con-

struction enables the operator to wholly remove all parts constituting the carriage, its supports and operative mechanism, by simply throwing the belt off the pulley and detaching the fastening connecting the bracket 20, with the main frame. The space whereby the record is caused to appear in a series of transverse lines lying upon the table in close parallelism, is produced by the intermediate action of the threaded shaft 39, arranged above and at right angles with the shaft 18. The ends of shaft 39 are mounted in cone bearings 40, supported in brackets 41, mounted on the main frame, at or near the side thereof, and the shaft is driven by a movement which will be explained hereinafter. Upon this surface is formed a screw thread of extremely low pitch, containing any suitable number of threads to the inch, from about thirty to fifty or more. The threaded surface engages the pillow-block or bearing 42, (see Fig. 12) having an interiorly formed (half-round) recess, adapted to fit the shaft and mesh its threads accurately. The block is suitably fastened in an arm 43, bifurcated at one end to provide two widely separated points of support. Each of said arms is provided with an eye 44, containing a split or longitudinally cleft bushing 45, which closely surrounds a supporting and guiding bar 46, the end of the latter being sustained in the brackets 41^a. The line-feed shaft 39, lies between this guiding and supporting shaft and a point just above the table, and the bifurcated portions of the arm 43, unite, before reaching the shaft 39, and the arm extends from the point of engagement of the pillow-block, to a point over the carriage, its end being united with, or forming part of a vertical curved flange 47, and a curved attaching plate 48, uniting with said flange at the lower edge of the latter, and thence extending beneath and laterally upon each side of the arm 43, to form, in conjunction with the flange, a means of attachment to the lower part of the sound-conducting tube, as fully described in a subsequent part of this specification. It will be observed that by this metallic construction of the attachment between the arm 43, and the diaphragm chamber, the frictional vibrations of the mechanism operating the line-feed, may be conducted along the shaft 39, and through the pillow-block 42, and arm 43, to the diaphragm chamber, which would be objectionable, especially in making a record. To obviate and overcome this, I make the slotted opening in arm 43, a little larger than the half nut or pillow-block, and insert pieces of felt or other suitable material to deaden the sound. I also place beneath the flanges 47 and 48, and above the diaphragm chamber, a piece of rubber or felt for the same purpose. Suitable belt washers are also provided for the attaching screws so that all metallic, or sound conveying connections are broken. The bushing 45, which is inclosed by means of eyes 44, at the forked ends

of the same arm 43, are formed of any suitable metal capable of resisting frictional contact and wear, such as aluminum, bronze, or other suitable metal or alloy. The bushings are cleft as shown in Fig. 8, to enable them to close upon the guiding and supporting shaft 46, as the contacting surfaces wear away and at all times maintain a firm sliding connection, having no play. The bushing 52, is preferably of the same length as the distance between the outer ends of the eyes of the bifurcated arms. The length of the bushings, may, however, be made to conform with the width of the eyes or boxes. The eyes 44, inclosing the bushings may also be cleft or divided, preferably, in the manner shown in Fig. 3, in which the eye is formed in two parts, both uniting with the arm at the fork, each forming a lug 49, to permit the insertion of a set screw 50, which passes through one lug and is tapped through the other to enable the bushing to be clamped on the shaft as the wear renders such adjustment necessary. I may however, effect this result by other means; for example, by tapping a screw through each eye inclosing the bushing as shown in Fig. 1.

I may mention here, that the cleft bushing 45, shown in Fig. 7, is for a similar purpose, and is used upon the guide-bar or rod 23, inclosed by the split boxes 24. These boxes, or bearings, are provided with lugs 49^a, (see Fig. 4) substantially the same as eyes on arm 43, heretofore described. (See Fig. 3.) The arm 43 constitutes the main support of a diaphragm-chamber 54, shown in Figs. 1, 2, 5, and 6. It is composed of a top, which is usually arched, or slightly convex, externally, especially near the ends. The longitudinal line of this chamber substantially coincides with the central longitudinal line of the arm 43. Upon the central portion of the top is seated the ring, or collar 47, secured in place by screws, or it may be cast or molded solid to the chamber as preferred. Said ring forming a support for what I term, the primary or main diaphragm 56, which I form, preferably, of glass, or its equivalent, in a thin film, properly annealed. There are many constructions by which this diaphragm may be secured in place, and I do not restrict my right to any one thereof, as it may be found desirable to modify the parts, as shown, in this respect. I have found a convenient method to consist in seating the diaphragm on an inwardly turned flange 57, and confining, or clamping it, by a ring, or annulus 58, entering the ring 47 and resting upon a suitable packing, or cushion, upon the edge of the diaphragm. A flange 59 on the annulus projects over the ring 47 and from its inwardly projecting edge rises a short tube 60, which serves as an attachment for the sound-conveyer, 61, which may be of any usual construction. I may here state, that I have found by experiments with the sound-conveyer, constructed similar to the forms shown in Fig. 1, that record can be satisfactorily reproduced,

using the same, curved, funnel-shaped tube, or conveyer, but when it is desired to limit the number of persons hearing the reproduction, the individual conducting tube may be used with the same satisfactory results. The ring 47 surrounds an opening in the top of the diaphragm-chamber, which is closed and sealed hermetically, or substantially so, by the diaphragm 56. The lower portion, or floor, of the diaphragm-chamber, is preferably, though not necessarily, formed of a flat, continuous strip, or plate 62, (shown in Fig. 29,) containing a series of openings 63 at substantially equal intervals. I have shown three of these openings, each of which is closed by a diaphragm, the central one, 64, being located directly beneath the primary diaphragm 56. The central and two outer diaphragms I have termed the secondary, or auxiliary diaphragms, each being formed of the same material as the primary diaphragm. They rest upon flanges 66 formed by counter-boring from the upper side of opening 63, flange 67 being formed around the margin plate 62, (as shown in Fig. 29.) The secondary or auxiliary diaphragms are laid upon suitable cushions resting upon flanges 66, and clamped down by superimposed plate 65, part of which is shown in Fig. 27. This portion is provided with openings registering with those in the plate 62, a downwardly turned flange or rib 66^a being formed around its openings. The flanges 66^a rest upon the edges of the secondary diaphragms. The plates 62 and 62^a (Figs. 27, 28, and 29) are clamped together by means of screws passing through the upper plate and tapped into the lower one. I will here note that when the plates are put together in this manner it is preferable to have flanges or ribs 66^a a little longer, say one sixty-fourth to one thirty-second of an inch than the top opening above the flanges 66, so that when the secondary diaphragms are placed in position, and the plates put together, by means of screws, the diaphragms can be rigidly clamped and held in place. I have shown and will describe hereinafter another method of mounting these diaphragms, although I regard the form already described preferable, but I do not restrict my invention to the employment of any specific construction of these parts. I form the diaphragm chamber, and the floor plates of any suitable material not likely to produce secondary vibrations, hard rubber, vulcanite, laminar, vulcanized fiber, and other compounds being well adapted for the purpose. The lower surface of the floor-plate 68 approaches as close to the carriage as is consistent with the unobstructed movement of the parts, and its front end is sustained by means of an arm 69 (Figs. 2, 13, and 14) mounted on the end of the chamber-wall, and provided with a threaded pin, adjustable vertically in the end of said arm, and giving a delicate and accurate adjustment to a fork 71, in which is journaled a traveler 72, which rests and rolls in either di-

rection upon a rail 73, supported upon brackets 74 arising from the table 2 and overhanging the carriage at a point a little above the same. The pin 70 is provided with a crank-arm 75 for convenience in turning it, and the arm 69 is usually provided with lugs to furnish a convenient handhold in raising the diaphragm chamber and its adjuncts to unmesh the pillow-block from the threaded shaft and remove the recorders, or reproducers from the tablets, and to set the diaphragm-chamber back, in case it was desired to have any portion or all of the record reproduced. For convenience in locating any part of the record, the upper edge of rail 73 is graduated, and index 71^a attached to the lower end of fork 71 (Fig. 14). The relation of the recording and reproducing points to the tablet may be very delicately adjusted by means of the threaded pin 70, by which, also, the meshes of the pillow-block with the line-feed shaft is controlled. The line-feed is imparted by a partial revolution of the shaft 39, a quarter rotation being usually found sufficient, even with a screw-thread fifty to the inch, thus giving a line-space of one two-hundredths of an inch, though this may be increased if desirable, I would prefer, however, to use a V screw of higher pitch, say thirty-five to forty threads to an inch. The intermittent revolution of the shaft 39 is produced by means of a ratchet-wheel 76^a, rigid upon one end of the shaft, and operated by means of push-pawls 77, pivotally connected to the extremities of arms, or bars, 78, which cross each other between these pivotal points, and their opposite ends, the latter being connected to the ends of longer bars 79, which converge to a point of pivotal attachment 80, upon a vibratory arm 81, rising from the frame 1 just beyond the end of the shaft 39. The said arm is connected by a rod 82 to a counterpart 83, also hinged, or pivoted, by its lower end to the frame 1, so that both will move in unison and in parallelism. Each of the arms 78 is pivotally connected to a rigid support 84, at such point (Fig. 10) that the sweep of said arm through an arc of ninety degrees, or thereabout, will not materially remove its extremity from the position it occupies with relation to the teeth of the ratchet, with which the pawls 77 engage. If the pivotal point 80 be moved horizontally, in the direction of the connecting arm 82, it will be seen that the ends of the arms 78 carrying the pawls, will separate, and then approach each other on the other side of the axis of the ratchet, as indicated in dotted lines in Fig. 10. As the pawls 77 both mesh the same way, or in the same direction of movement, and as the points of pivotal attachment of the pawls move in opposite directions, one of the pawls will be retracted to prepare for its operative movement, while the other is carrying the ratchet 76 forward.

The movement of the devices described, which somewhat resemble a "lazy-tongs," is effected by a stud, or finger-bar, 85, mounted

on the carriage 4 at such point that it moves between the upper ends of the swinging bars 81 and 83, the distance between which is exactly equal to the full length of a line of the record. As the pawls act in opposite directions of movement, as already described, they alternately advance the ratchet 76 and alternately move back to re-engage its teeth. Bearing in mind the fact that the action of each pawl is produced by the movements of the carriage, it will readily be seen that during the time occupied by the stud or finger-bar 85, in swinging either bar 81 or 83, the line-feed shaft will act concurrently with the direct-feed, their conjoint operation giving a rounded, or curved angle to the record as it passes the interval between the connected ends of the adjacent lines. The manner in which and the means by which periodic movement is imparted to the line-feed shaft may be considerably varied, but it must be so connected with the action of the direct feed, that the combined function of both shall effect a continuous, unbroken record, which shall be followed by the reproducer with ease, and without substantial variation or indistinctness in the sounds. It will be noted that if the arm 78 was journaled on the end of line-feed shaft 39, one of the arms being located upon either side of ratchet 76^a, the rigid support 84 heretofore described, and shown in Fig. 10 would be dispensed with. It will also be noted that by placing two lugs or pins on the end of the table at suitable distance apart, and dispensing with the arms 82 and 83, substantially the same movement or movements of the line-feed shaft will be produced, as that which has been heretofore fully described.

The recording stylus I employ is of duplex form, or, in other words, is so constructed as to act both as a recorder and as a reproducer. It is shown in detail in Fig. 35, and consists of a slightly rounded recording point, or portion 86, and a rounded reproducing point, or portion, 87, both connected to an intermediate part 88, which is provided with an opening 88^a, to receive a pivotal support, or journal, upon which the stylus may be turned, to bring either point into action. This reversal in position is effected by means of a lever 89, fulcrumed upon the end-wall of the diaphragm-chamber, as shown in Fig. 5, its end being provided with a segmental gear, or curved rack, 90, meshing with a pinion 91 on the end of a small shaft 92, supporting the stylus, and having a hinge, or pivotal point 93, as seen in Fig. 34, so formed as to permit the free movement of the stylus in response to vibratory impulses from the diaphragm. The shaft is sustained at, or near, the pivotal or other joint 93 in a drop-bearing 94, (Fig. 5) and its end is supported in an exceedingly light frame 95 (see Fig. 5) in which the stylus hangs. This frame consists of two parallel drop-plates, united at their upper ends by a head 96 and provided a little above the latter

with a similar head, 97, said parts being connected by a neck, which is engaged by the forked end of an impulse-lever, 98, hereinafter to be described. The stylus being compelled to cut in three different directions, first along the transverse line, second over the line space at one end of the line, and third along the succeeding transverse line, it may be provided with an equal number of cutting faces upon the end, or portion 86. The reproducing end 87 I provide with a small spherical point 99, which I prefer for this purpose, as being less liable to wear or injure the record.

One of the duplex styles described is attached to, or connected with, each of the outer diaphragms 100, lying adjacent to the diaphragm 64, the connection being made in the following manner: The upper head of the frame in which the stylus is mounted is usually laid against the center of the diaphragm, and cemented, or otherwise attached thereto, in such a manner as to respond fully to every vibratory movement of the diaphragms. As the non-central diaphragms 100 are not as directly exposed to the phonetic vibrations as the main diaphragm, it is desirable, in order to obtain the full effect, to connect the main diaphragm with each secondary diaphragm, in order that the latter may be caused to vibrate in unison with the former, and with the same intensity. I, therefore, connect the center of the diaphragm 56 with the centers of each of the secondary diaphragms 100, by means of elastic filaments, or needles 101, having a reflex curve, which causes their extremities to point toward the respective diaphragms. These needles, or filaments, which may be made of metal, glass, or other suitable substance, are secured to the diaphragms by means of radiating filaments 102, of unequal length, (see Figs. 5, 30, 32, 39) their ends being attached to the filaments 101 at a point a little beneath the main diaphragm, 64, and their other ends attached to the diaphragm at points unequally distant from the center, from which they radiate at suitable intervals, or angles, according to the number of radial filaments used. The connecting filament 101 is continued from the point of its union with the radial filaments to the center of the diaphragm, or substantially so, to which it is connected by cementing or welding, or by drilling and inserting the extremity of the filament through, or into, an aperture in the diaphragm. The other extremity of each filament is connected with one of the secondary diaphragms 100 in a similar manner, the only difference being that the connecting filaments 101 radiate from the upper, instead of the lower face of the diaphragm, the end of the connecting filament being continued to the center thereof. If preferred, it may be passed through an aperture in the center and connected directly to the hanger-frame 95.

By means of the non-central attachment of the filaments 102, at points unequally distant from the center of the diaphragm 100, I am

enabled to take the vibrations off the main diaphragm at different points, and between different nodal circles, whereby I can transmit to the secondary diaphragms very nearly all the energy of each vibration of the main diaphragm, and obtain a clear, well defined record. It should be noted, in this connection, that the secondary diaphragm will ordinarily respond to the action of the main diaphragm, by reason of the fact that the diaphragm-chamber is hermetically closed, and the confined body of air therein must necessarily receive and transmit any action of the main diaphragm. The position of the secondary diaphragms 100, however, is not as favorable as that of the central diaphragm, 64, and to obtain for all sounds a full response, in the action of the recorder, and secure a perfect reproduction of the record, I have found it advantageous not only to connect the main diaphragm 56 with the secondary diaphragms 100, in the manner described, but to also connect the central diaphragm 64, in the secondary series, with each diaphragm 100 in the following manner: The lever 98 being connected at its end to the hanger-frame 95, as already pointed out, its power-end is pivotally connected to a hanger 104 on the central diaphragm 64, the fulcrum 105 of the lever being secured to the floor-plate 62 of the diaphragm-chamber at such point that the longer arm of the lever shall be between the fulcrum and the point of attachment to the hanger 95. To the other end of the lever 98 is pivotally connected the end of a second lever 106, the power end of which is connected to the hanger on the central diaphragm 64, the fulcrum 107 of the said lever being at such a point that its longer arm is between said fulcrum and the point of attachment to the said hanger, thus restoring the power lost by the position of the fulcrum of the lever 98. A similar system of levers is also arranged to connect this hanger with the support for the other stylus. It is unnecessary to state that the arrangement is such that the distance between the two recording instruments is substantially equal to the distance from the edge of one tablet, when placed upon the carriage, to the corresponding edge of the other tablet. The main diaphragm 56 may, also, be connected to the central diaphragm by means of a straight, vertical needle, or filament, 109, its extremities being provided with the radiating, connecting filaments, in the manner already described.

The construction described is capable of some modification. For example, the system of levers 98 and 106 may be duplicated above the secondary diaphragm, as seen in Fig. 26. In this form the lever 110, corresponding to the lever 98, has its power end connected to a filament, or needle, 112, which may be extended through the diaphragm and connected to the hanger 95. The second lever 113, which corresponds with the lever 106, is connected at its power-end to the straight filament 109.

When this duplicate system is used the filaments 102 may, if preferred, be dispensed with, and I shall also dispense with the filaments 101 and probably with the filaments 109. I may also connect the end of each of the radial filaments to the diaphragm 100, or to the main diaphragms, by a series of radial attaching filaments 114, as shown in Figs. 30, 32 and 39.

In the construction of the diaphragms, I prefer to adopt the mounting shown in Figs. 31 and 32, although the construction shown in Figs. 5, 26, and 29 will give good results. In Figs. 31 and 32 the diaphragm is set in a solid annulus; or, in what is substantially the same thing, a support-ring 115, surrounding its outer edge, and its upper and lower marginal surfaces. I have found in practice that this support is less susceptible to the action of false vibrations than others.

I use a preparation for the tablets which will give a smooth and unbroken record, free from air-cells and other inequalities, or comparatively so. These tablets may evidently be made as large as desired, but I have found a size suitable for a No. 6½ envelope is very convenient. The duplicate tablet is intended for preservation as a copy, but I may observe that in reproducing, this duplication of the phonetic record gives rise to some valuable and interesting results. The reproduction is multiplied in power by its use, and gains in distinctness, and uniformity of volume; and by recording a vocalization, for example, upon one surface first, and then recording a second part, bearing a relation to the first similar to that of the alto to the soprano, some very pleasing effects are produced. I may, also, here note, that the tablet being perfectly flat, or substantially so, either, or both sides of the tablet may be used in making a record.

By the use of the diaphragm-chamber, whose walls contain the main and secondary diaphragms, I am enabled to eliminate all, or nearly all, of the effects produced by what is known as false vibrations, which are amplified and lost in the diaphragm-chamber, or destroyed so far as to cause no unpleasant results.

I have found in practice, that by using a diaphragm-frame similar to that shown in Fig. 31, in which the edge, and both the upper and lower margins of the diaphragm, which I form of malleable glass, are inclosed, I obtain less false vibrations with the construction in which the edge of the diaphragm is clamped down.

By connecting the main diaphragm 56, which is the largest, with the smaller central diaphragm 64, below, and with the two adjacent diaphragms 100, I am able to utilize the full power of the phonetic vibrations set up in the main diaphragm. It should be noted, also, that, by the radial filaments connected to the diaphragm at points unequally distant from the center, I am able to render the phonetic vibrations of varying intensity, from

these different points, available in the operation of the stylus.

The attachment should be made at points between the nodal circles, and between different nodal circles, in order to obtain the full strength of the phonetic vibrations.

What I claim is—

1. In a phonograph, the combination with a diaphragm and drop-stud, of filaments set in the upper ends of the said drop-stud and connected at their other ends to the diaphragm in different nodal circles, substantially as described.

2. The combination in a phonograph, of a movable support adapted to receive and retain a plurality of recording surfaces, an independent stylus for each of said surfaces, a single main or primary diaphragm receiving and responding to phonetic vibrations, secondary diaphragms intermediate the styles and primary diaphragm, and devices by which the styles and diaphragms are connected to transmit the phonetic vibrations, substantially as described.

3. The combination in a phonograph of a support adapted to receive and retain a plurality of recording surfaces, a plurality of styles for recording upon, or reproducing from, said surfaces, a single primary diaphragm responding to the phonetic vibrations, secondary diaphragms intermediate of the styles and primary diaphragm, and intermediate connections by which the vibrations of the single main diaphragm are transmitted to both the secondary diaphragms, substantially as described.

4. The combination in a phonograph of a support adapted to receive and retain a plurality of recording or reproducing surfaces, a plurality of styles adapted to record or to reproduce in or from said surfaces in unison, a primary diaphragm receiving and responding to the phonetic vibrations, a series of secondary diaphragms one of which has its center substantially in the axial line of the primary diaphragm and a system of levers each supporting one of the styles at one end and at the other end connected to the central secondary diaphragm, substantially as described.

5. The combination, in a phonograph, of a carriage or support to receive and retain a plurality of recording or reproducing surfaces, a plurality of duplex styles pivoted between their ends and having separate recording and reproducing portions, a primary diaphragm, a series of secondary diaphragms, the middle one of which is arranged beneath the primary diaphragm, intermediate connections between said primary diaphragm and the secondary diaphragm, and a system of levers to the ends of which the styles are pivotally connected, their other ends being connected to the outer ends of levers the inner ends of which are connected with the central diaphragm, substantially as described.

6. The combination, in a phonograph of a primary diaphragm located in, or beneath,

the sound conveyer, and forming part of the closed top of a diaphragm chamber, a series of diaphragms arranged beneath the primary diaphragm and connected thereto, said series forming part of the floor of the diaphragm-chamber a plurality of levers having their ends connected to one of said series, a second system of levers having pivotal connection with the power ends of the levers of the first system, and a plurality of styles pivotally connected to the other extremities of the levers of the second system, substantially as described.

7. The combination, in a phonograph, of a primary or main diaphragm arranged to receive the phonetic vibrations, a series of secondary diaphragms, a corresponding series of connections between the primary and the secondary diaphragms, having attachment at a plurality of points located at unequal distances from the centers of said diaphragms a system of levers attached to one of the secondary diaphragms a second system of levers actuated by those of the first system, and a plurality of styles connected to and operated by the levers of the second system, substantially as described.

8. The combination, in a phonograph of a platform, or support, for a recording tablet, means for feeding the same, a closed diaphragm-chamber having a main diaphragm receiving the phonetic vibrations, and forming part of the top of said chamber, a series of secondary diaphragms arranged beneath and forming part of the floor of said chamber, and styles partly supported by two of said secondary diaphragms, substantially as described.

9. In a phonograph, the combination with a main or primary diaphragm receiving the phonetic vibrations, of a series of secondary or auxiliary diaphragms forming part of the floor of a diaphragm-chamber which is closed, above, by the main diaphragm, needles connecting the latter diaphragm with each of the secondary diaphragms, two independent styles supported by two secondary diaphragms at substantially equal distances from the center of the main diaphragm, and levers having their ends connected to the styles and to a central secondary diaphragm, respectively, and having their fulera intermediate, substantially as described.

10. In a phonograph the combination with a suitable support, adapted to retain one or more tablets, of a shaft having continuous revolution and provided with threads of opposite pitch, which alternately engage feed dogs pivoted on said support and tripping-bars mounted on the machine frame at the ends of each opposite thread on said shaft to trip the dogs out of mesh with said threads, alternately, substantially as described.

11. The combination, in a phonograph, of a diaphragm, receiving the phonetic vibrations, and a stylus connected thereto by filaments

radiating from a point on said stylus below the diaphragm and connected to the latter at points unequally distant from the center, substantially as described.

12. In a phonograph, the combination with a recording or reproducing stylus, of filaments connecting the same to the diaphragm by the vibration of which the device is rendered operative, said filaments being connected at one end at a little distance from the surface of the diaphragm and at their other ends attached to said diaphragm between different nodal circles, concentric with the stylus and diaphragm, but of unequal radii substantially as described.

13. In a phonograph the combination with a stylus of filaments attached at one end to the stylus a little distance from the surface of the diaphragm, and each of their other ends being connected to said diaphragm at a different distance from the center and by a plurality of connecting filaments, substantially as described.

14. The combination in a phonograph of a stylus, a main diaphragm receiving the phonetic vibrations, a secondary diaphragm beneath and connected to the main diaphragm, a second diaphragm adjacent to the first secondary diaphragm, a connection between the latter and the main diaphragm, and between the main diaphragm and the adjacent diaphragm, a stylus mounted on the latter and a lever connected at one end to said stylus, and at the other end to the end of a second lever, the power end of the latter being connected to the first secondary diaphragm, substantially as described.

15. The combination in a phonograph of a main diaphragm, a series of secondary diaphragms, a pair of styles connected to two of the secondary diaphragms, arranged adjacent to a central secondary diaphragm beneath the main diaphragm and a carriage or support for a duplicate record, the four diaphragms being set in the wall of a closed chamber directly beneath the sound conveyer and the main diaphragm and containing a body of air sealed therein, substantially as described.

16. The combination in a phonograph of a carriage, means for imparting reciprocating linear movement thereto, a threaded shaft intermittently rotated to impart the line feed, at the end of each parallel line of the record, a pawl and ratchet mechanism, and arms connected at one end to a vibratory bar, which is connected to a similar parallel bar, to operate the pawl-carrying arms in opposite directions, the carriage being provided with a stud, or finger, moving between the vibratory bars and coming alternately into contact therewith, substantially as described.

17. In a phonograph, the combination with a stylus consisting of a recorder, a reproducer and an intermediate pivotally supported portion mounted on a shaft provided with a pinion, of a segmental gear meshing with said

pinion, whereby the stylus may be reversed to bring either the recorder or the reproducer into action, substantially as described.

18. In a phonograph, the combination with
5 two independent styles each of a duplex construction, of jointed shafts, on the ends of which said styles are mounted, diaphragms to which the frames supporting the ends of the jointed shafts are mounted, and means
10 for imparting a semi-rotation to said shafts

to reverse the styles, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

STEWART DIXON McKELVEY. [L. s.]

Witnesses:

J. W. ROEBUCK,
G. N. SHANER.

(No Model.)

E. H. AMET.
ERASING ATTACHMENT FOR PHONOGRAPHS.

No. 521,456.

Patented June 19, 1894.

FIG. 1.

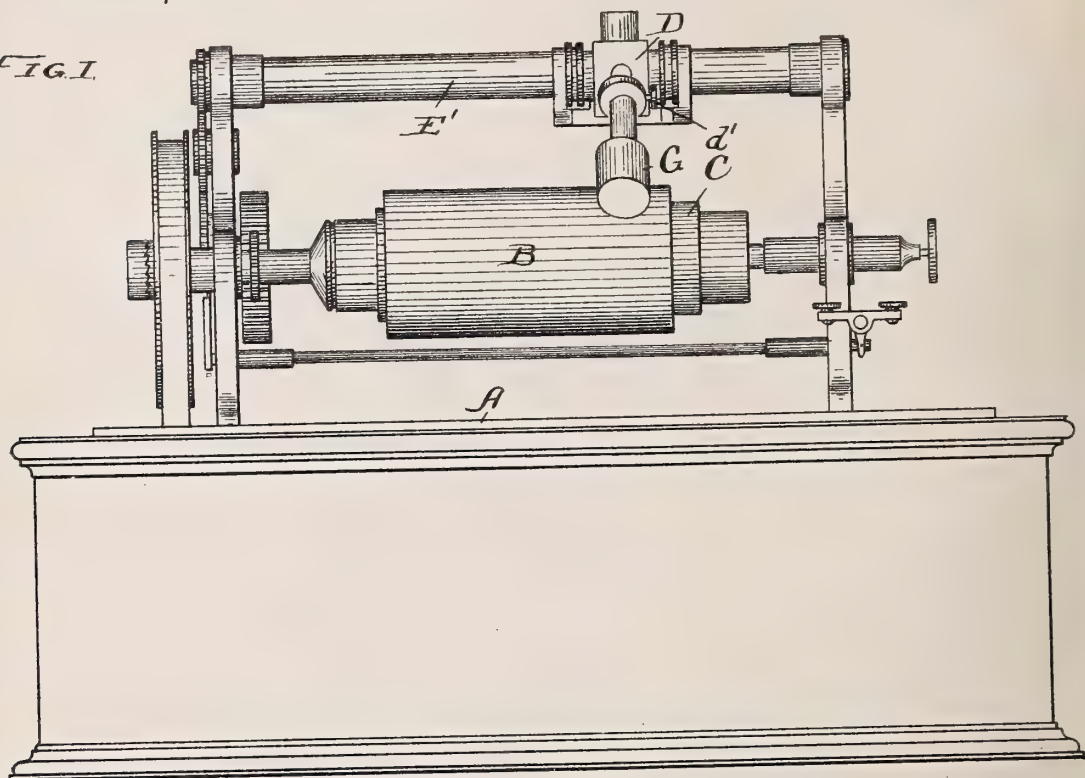


FIG. 2.

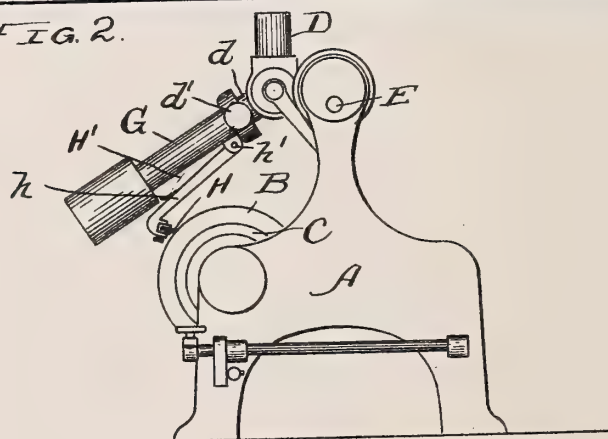
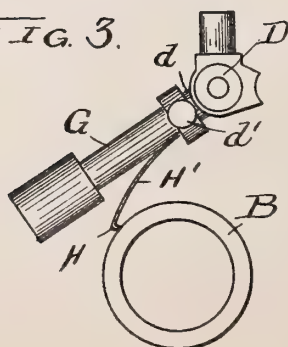


FIG. 3.



WITNESSES:
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A. W. Munday

INVENTOR:
EDWARD H. AMET
BY *Munday, Everts & Adcock,*
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF CHICAGO, ILLINOIS.

ERASING ATTACHMENT FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 521,456, dated June 19, 1894.

Application filed February 10, 1894. Serial No. 499,699. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Erasing Attachments for Phonographs, of which the following is a specification.

My invention relates to improvements in graphophones, phonographs or other machines for recording or reproducing sounds upon cylinders of wax or other analogous material, and more particularly to improvements in devices for paring or renewing the surface of the wax or other cylinder to permit it to be used over and over again.

The object of my improvement is to provide a paring device of a simple and efficient construction which will operate to perfectly pare or smooth the surface of the wax cylinder after it has been once used.

To this end my invention consists in connection with a revolving chuck or holder for supporting and revolving the wax cylinder and a traveling block or trunnion for moving the knife from one end of the cylinder to the other, (the same being preferably the same traveling block or trunnion which, when the machine is in use, moves the needle supporting arm and diaphragm from one end of the cylinder to the other) of a paring knife mounted upon a weighted arm by which it is pressed against the cylinder, there being a spring connection between the knife and the weighted arm, so that the knife may follow any inequalities or irregularities in the true circular shape of the cylinder without producing any injurious vibrations in the weighted arm. The weighted arm is of course movable to enable it to press the knife against the cylinder, and it is preferably pivotally mounted. The paring knife is preferably made in a separate piece from the spring which constitutes the spring connection between the knife and the weighted arm; but the knife and spring may be formed of the same piece of metal, as will be obvious to those skilled in the art. By this means I am enabled to cut a shaving of uniform thickness and of just the required thickness from the cylinder and to leave the surface of the cylinder smooth and continuous, so that it will properly record and repro-

duce sounds to be written or reproduced upon it by the needle.

In the accompanying drawings I have for convenience illustrated my invention as applied to a graphophone of the ordinary type now in use, although it will be readily understood by those skilled in the art that my invention is applicable to any kind of writing or talking machine, wherein a wax or analogous cylinder is employed.

In the drawings, Figure 1 is a front elevation and Fig. 2 an end elevation of a machine or device embodying my invention. Fig. 3 illustrates a modification wherein the knife and the spring connection between it and the weighted arm are in one piece.

In the drawings A represents the frame of the machine, B the wax or other cylinder which is to be pared, C its revolving chuck or holder by which it is supported and revolved, and D the traveling block or trunnion of the graphophone which carries the needle from one end of the cylinder to the other in the ordinary operation of the machine. Connected to the sliding block or trunnion is an arm or sleeve *d* to which the needle carrying arm is ordinarily connected. The sliding block or trunnion D is moved back and forth in the direction of the length of the cylinder by a screw E inside the slotted tube E' in the usual manner. As the construction of these parts is perfectly familiar to those skilled in the art, a detailed description of them is unnecessary to a full understanding of my improvement. Only the end of the screw E is shown in the drawings.

G is a weighted arm adapted to be connected and disconnected by a set screw *d'* with the arm *d* on the trunnion D.

H is the paring knife mounted upon the weighted arm G. The weighted arm G thus serves to press the knife H against the surface of the cylinder with the required force to cause it to cut a thin shaving from the cylinder B as it revolves.

H' is a spring connection or cushion between the knife H and the weighted arm G, in order that the pressure of the movable weighted arm G may be exerted upon the knife H through the spring or cushion H', so that any of the movements of the knife to

and from the center of the cylinder which may be necessary to enable it to follow any irregularities in its shape will be taken up by the spring or cushion H', and thus not be communicated to the weighted arm G. Any vibration in the weighted arm which would tend to produce sharp irregularities in the surface of the cylinder and cause the shaving to be cut too thick or thin at parts and interfere with the operation of the machine in recording or reproducing sounds is thus prevented. The knife H is preferably fixed in an arm *h* pivoted at *h'* to the weighted arm G and the spring H' is inserted between the arm *h* and the weighted arm G, so that the pressure of the weighted arm G is exerted upon the knife H through the spring H'.

In Fig. 3 I have shown a modified construction in which the secondary pivoted arm *h* is omitted and the knife H made integral with the spring H'.

Instead of employing the traveling block or trunnion D of the sound recording or reproducing machine as a means of moving the knife longitudinally along the cylinder as the latter revolves, the knife may be mounted upon any other suitable traveling block or device, and it will also be understood by those skilled in the art that any suitable chuck or holder for supporting and revolving the cylinder may be employed if desired.

I claim—

1. In a sound writing or reproducing machine, the combination of a revolving chuck or holder for supporting and revolving the wax or other cylinder, of a knife for paring or smoothing the cylinder, a movable weight for pressing the knife against the cylinder, and a spring connection or cushion between the knife and said movable weight, substantially as specified.

2. In a sound recording or reproducing machine, the combination with a revolving chuck or holder for supporting and revolving the wax or other cylinder, a traveling block or trunnion, a weighted arm carried by said traveling block or trunnion, a paring knife carried by said weighted arm, and a spring con-

nection or cushion between the knife and weighted arm, so that the pressure of the weight is exerted upon the knife through the spring or cushion and the knife thus permitted to follow inequalities in the cylinder without producing injurious vibrations of the weighted arm, substantially as and for the purpose specified.

3. In a sound recording or reproducing machine, the combination with a revolving chuck or holder for supporting and revolving the wax or other cylinder, a traveling block or trunnion, a weighted arm carried by said traveling block or trunnion, a paring knife carried by said weighted arm, and a spring connection or cushion between the knife and the weighted arm so that the pressure of the weight is exerted upon the knife through the spring or cushion and the knife thus permitted to follow inequalities in the cylinder without producing injurious vibrations of the weighted arm, said knife being secured to secondary arm *h* pivotally connected to said weighted arm and the spring acting against said secondary arm *h*, substantially as specified.

4. The combination in a wax or other cylinder paring device, of a revolving chuck or holder for supporting and revolving the cylinder, with a paring knife, a movable weight for pressing the paring knife against the cylinder, and a spring connection or cushion between the knife and said movable weight, substantially as specified.

5. The combination in a cylinder paring device of a revolving chuck or holder for supporting and revolving the cylinder, of a traveling slide or block, a weighted arm pivotally connected to said slide, a knife or tool for paring or smoothing the surface of the cylinder, and a spring connection between said knife or tool and said pivotal weighted arm, substantially as specified.

EDWARD H. AMET.

Witnesses:

H. M. MUNDAY,
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(No Model.)

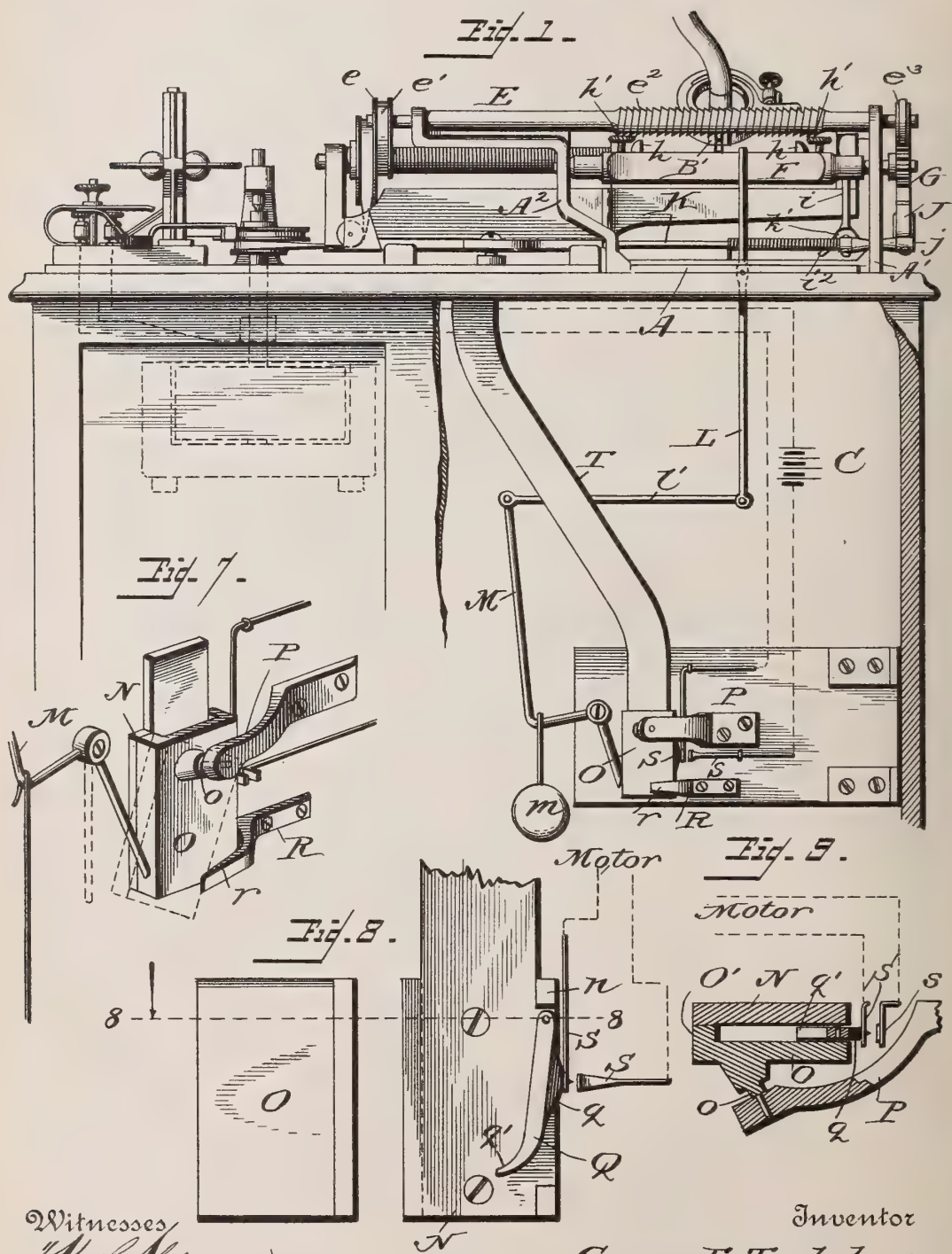
3 Sheets—Sheet 1.

G. E. TEWKSBURY.

COIN OPERATED MECHANISM FOR PHONOGRAPHS.

No. 523,556.

Patented July 24, 1894.



Witnesses
James L. Lacey
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(No Model.)

3 Sheets—Sheet 2.

G. E. TEWKSBURY.

COIN OPERATED MECHANISM FOR PHONOGRAPHS.

No. 523,556.

Patented July 24, 1894.

Fig. 2.

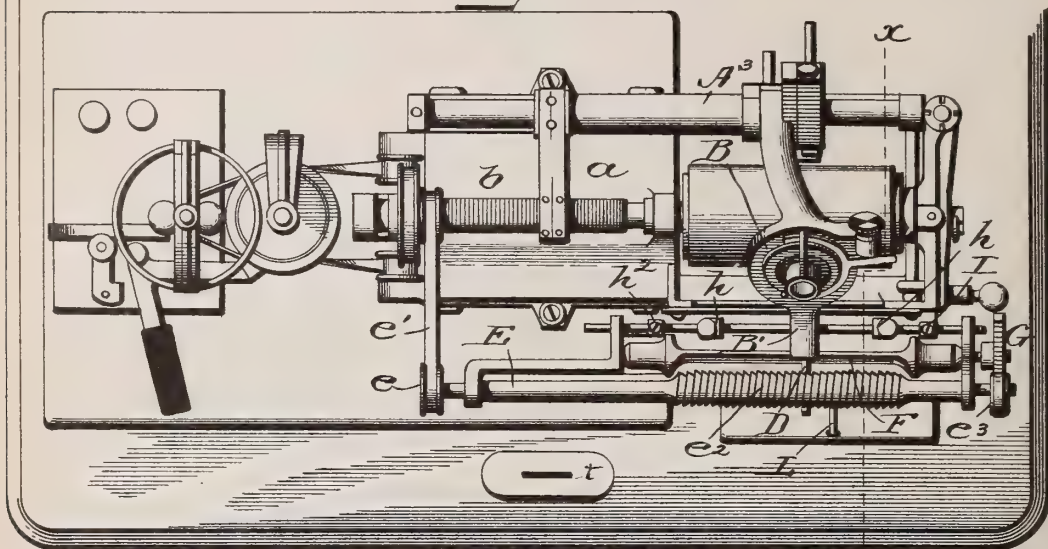


Fig. 3.

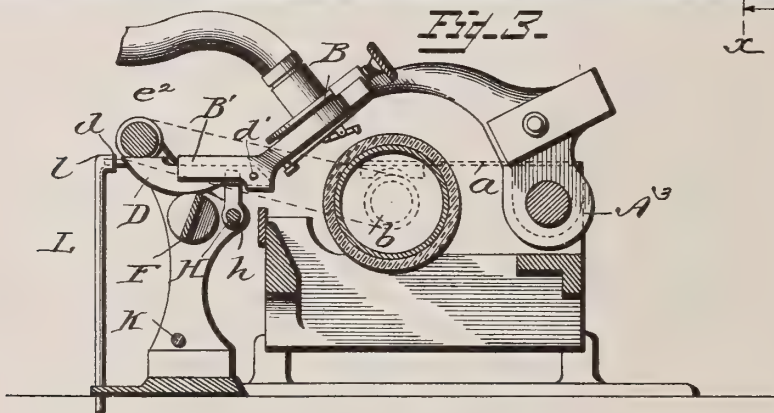
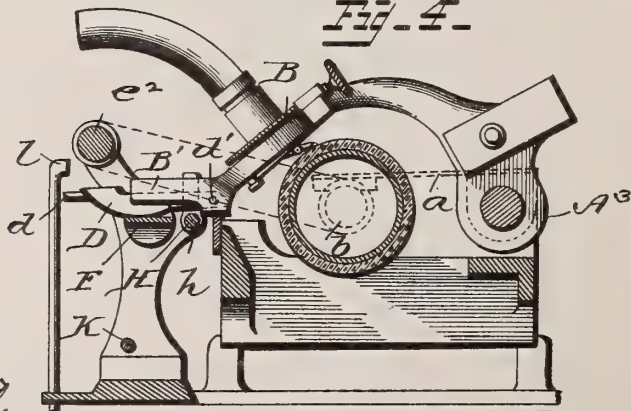


Fig. 4.



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(No Model.)

3 Sheets—Sheet 3.

G. E. TEWKSBURY.

COIN OPERATED MECHANISM FOR PHONOGRAPHS.

No. 523,556.

Patented July 24, 1894.

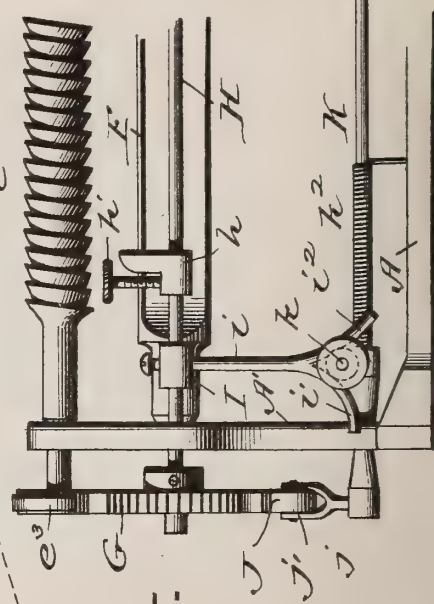
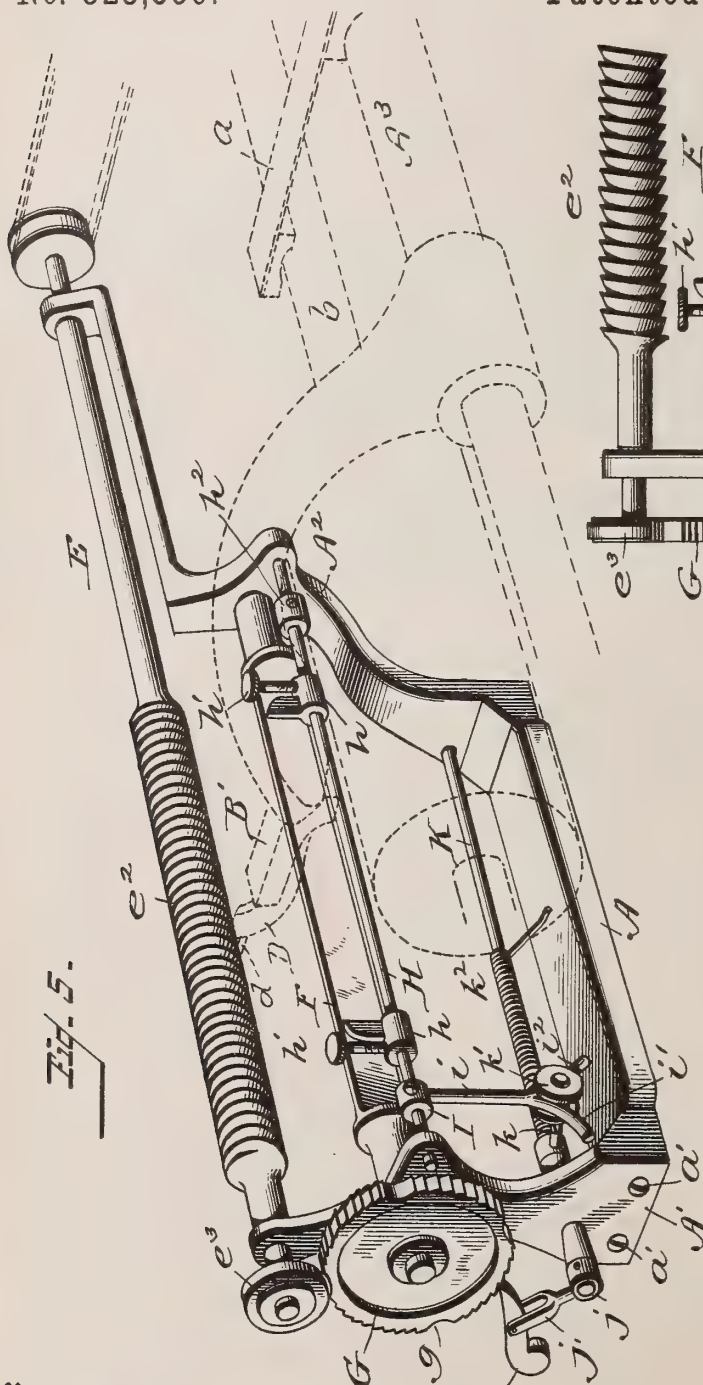


Fig. 5.

Witnesses
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Lillie M. Willyard

Inventor
George E. Tewksbury.
By Attorneys *Wm. H. Lacey*

UNITED STATES PATENT OFFICE.

GEORGE E. TEWKSBURY, OF TOPEKA, KANSAS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES PHONOGRAPH COMPANY, OF NEW JERSEY.

COIN-OPERATED MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 523,556, dated July 24, 1894.

Application filed November 30, 1892. Serial No. 453,576. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. TEWKSBURY, a citizen of the United States, residing at Topeka, in the county of Shawnee, State of Kansas, have invented certain new and useful Improvements in Coin-Operated Mechanism for Phonographs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to coin operated mechanism for phonographs; and has for its object to start the phonograph by dropping a nickel in a slot, permitting the diaphragm to traverse the length of the wax cylinder or any such part thereof as may be desired, and afterward to automatically stop the same, leaving the phonograph in such a position that another nickel similarly applied will repeat the operation, doing all of this without interfering with or retarding the mechanism of the phonograph or impairing the quality of its reproduction.

The improvement consists of the novel features and the peculiar construction and combination of the parts which will be hereinafter more fully described and claimed and which are shown in the accompanying drawings, in which—

Figure 1 is a front view of a phonograph of ordinary construction showing my invention applied, parts of the cabinet being broken away, showing the coin chute and the coin actuated mechanism, which for convenience is placed below the table on which the phonograph is placed, and the connections between the said mechanism and the diaphragm controlling mechanism. Fig. 2 is a top plan view of a phonograph and the invention applied thereto. Fig. 3 is a section on the line X—X of Fig. 2 looking in the direction of the arrow, showing the diaphragm-controlling mechanism in gear. Fig. 4 is a section similar to Fig. 3, showing the diaphragm-controlling mechanism out of gear and the phonograph feed mechanism in gear. Fig. 5 is a perspective view of the diaphragm controlling mechanism on a larger scale. Fig. 6 is a rear view of one

end of the diaphragm controlling mechanism. Fig. 7 is a perspective view of the coin actuated mechanism for making and breaking the circuit to start and stop the phonograph. Fig. 8 is an inside view of the pivoted cap detached and the back plate of the coin actuated mechanism, respectively, showing the terminals of the circuit. Fig. 9 is a horizontal section of the coin-actuated mechanism on the line 8 8 of Fig. 8.

The phonograph is of ordinary construction and is operated by an electric motor shown by dotted lines in Fig. 1 in the usual manner and which receives a current from any convenient source, as the battery C. The sleeve A³ having the diaphragm Bat one end and the spring arm *a* at the other end carrying the twin nut which operates with the feed shaft *b* to carry the diaphragm over the record, is of well known construction and arrangement and is referred to because more intimately related to the invention and mechanically operated by the diaphragm controlling mechanism.

The frame is composed of the plate A and the standards A' and A², the standard A' being preferably detachable and held to the plate A by fastenings as the screws *a' a'*, being pierced at proper points to form bearings for and support the working parts of the diaphragm controlling mechanism.

B' is the front end of the diaphragm supporting arm of the phonograph proper which is provided with a slot on the under side to receive the feed lever D and brace the same laterally.

E is the main shaft of the mechanism, and is provided with a pulley *e* around which passes one end of a belt *e'*, the other end passing around a pulley on the feed shaft *b* of the phonograph. This shaft is also provided with a left handed screw thread *e²* and friction pulley *e³*. This friction pulley *e³* may be constructed of rubber or other elastic or yielding substance, or may be a rubber ring sprung over a grooved pulley, and is firmly secured on shaft E to revolve therewith. The shaft E is always in motion when the phonograph is running.

F is a cam roller, or flat bar, so constructed as always to balance on its journals which are supported in the standards A' and A^2 of the main frame of the structure. When this cam roller or flat bar is in the position shown in Fig. 3 of the drawings, the lever D attached to the arm B' rests on the straight edge thereof, completely disengaging the diaphragm from the feed shaft b during the travel of the diaphragm to a starting point for reproducing the record. To this cam roller or flat bar F is attached a toothed wheel G having mutilations g to permit the friction roller e^3 to rotate freely during the travel of the diaphragm to the starting point for reproducing the record and to a normal position after the record has been reproduced. The mutilations, four in number preferably, conform to the shape of the cam roller as shown, and are formed by cutting out a sufficient number of the ratchet teeth to permit the continuous turning of the friction pulley e^3 without revolving the cam roller or flat bar F. This cam roller or flat bar F is so constructed that in operation it raises and lowers the phonograph diaphragm by means of the lever D hereinafter more particularly described attached to the arm B' heretofore referred to, thereby starting and stopping the reproduction of the sound, without jar or interference with the reproducing adjustment of the phonograph.

H is a rod that is adapted both to slide and rock in the standards A' and A^2 of the frame of the machine as shown, to which are attached two movable stops h held in the required position by thumb screws h' for the purpose of limiting the travel of the phonograph diaphragm, and thereby providing the means of securing an accurate beginning and ending of the phonographic record. Attached to the rod H near one end is the collar h^2 , held in place by a binding screw, or other device, and serves to limit the movement of the rod in one direction. The collar I near the other end of the rod H is held thereon by a binding screw and is provided with a fork which consists of a rod i with forked ends i' and i^2 which operate the pawl J carried by the rock shaft K through intermediate mechanism hereinafter described, by depressing the arm k , projected from the said rock shaft K by means of the reciprocal motion of said rod H. The anti-friction roller k' on the arm k enters the angle formed by the diverging ends i' and i^2 , and is depressed as the fork is moved either to the right or the left.

K is a rock shaft mounted in the standards A' and A^2 and is yieldingly held in a normal position by a spiral spring k^2 which is mounted thereon. One end of the spring k^2 is secured to the rock shaft and the other end is extended, and rests on the base or plate A. The purpose of the spring k^2 is to hold the pulley k' in operative relation to the fork.

The collar j attached to rock shaft K by a binding screw, is provided with the arm j'

which carries the pawl J. This pawl J by its forward motion at the proper time caused by the depression of the arm k rocking the shaft K moves the mutilated gear forward until it is engaged by the friction roller e^3 which roller being in motion moves the mutilated gear wheel to the next mutilation at which point the friction roller becoming disengaged the cam roller or flat bar F ceases to revolve, having during its partial revolution raised or lowered the phonograph diaphragm from or to the phonograph record and engaged or disengaged the arm a with or from the feed screw b on the phonograph and at the same time effected an engagement or disengagement of the lever D with or from the screw thread on the shaft E.

D is a feed lever placed in the slot provided in the under side of arm B' and pivotally connected therewith by the pivot d' . This lever is made with a projecting end in the rear of pivot d' to prevent its dropping more than enough to disengage itself from the screw thread e^2 when arm B' of the phonograph diaphragm is raised independently of the mechanism, as is necessary to be done when the record cylinders are moved or replaced, thus avoiding the danger of damage to the said cylinders. Also, this lever is so made as to have ample play, being set loosely in the said slot of arm B' so as to prevent binding or locking at the moment of engagement with the left hand screw thread e^2 of shaft E or during its travel while being actuated by said shaft E.

The under side of the front end of the lever D inclines upward, to permit the cam roller or flat bar F to turn at the proper time without raising the lever D or any portion of the weight of the diaphragm or of the phonograph, until the friction pulley e^3 has engaged the mutilated spur gear G. This lever D is also provided with a projecting point d at the front, which in the return movement of the lever D presses against the bent end l of lever L (it having passed under said bent end without contact during the forward travel of the phonograph arm carrying the lever D) releasing the nickel or coin below and breaking the electrical circuit which actuates the phonograph thus completing one operation after the operating parts have been returned to the place of beginning.

L is a trip lever mounted on a fulcrum between its ends, which has positive connection with the base A and has a projecting arm or bend l at the upper end, against which the projecting point d of the feed lever D, as above described, presses in passing on its return motion, while the cam roller or flat bar has its widest diameter vertical as shown in Fig. 3, but which hook is not disturbed during the forward or right hand motion of the feed lever D, while the widest diameter of the cam roller or flat bar is in the position shown in Fig. 4 with lever D resting on the flattened side. At the lower end lever L is

connected with the lever M by the link l' forming an adjustable yet sensitive connection with the coin actuated mechanism, and thus perfectly controlling the entire nickel or coin operated action and hence the opening and closing of the electric circuit. These or equivalent connections are essential because it admits of the coin actuated mechanism being located at any convenient point above or below, or at either side, if a cabinet be used for setting up the machine, without in any manner affecting the reliability of the entire device, phonograph included. The connection by link l' through modification of the link motion, makes this possible.

N is the sustaining base of the coin operated action and may be attached to the cabinet or table, by bracket, bolt, or angle iron, as most convenient from either end or side. This base with the cap or front wall O forms the coin chute or the termination of the same. The cap or front wall O is held in place by pin or journal o projected from its side near the upper left hand corner, at an outward and forward angle of perhaps twenty-two degrees, said pin or journal having a shoulder and working freely in a bearing provided in the bracket arm P, when the pressure of lever M is withdrawn or applied to the edge of the said cap or wall O.

By reason of the angle and eccentric location of the pin or journal o the front wall or cap O instantly moves forward and laterally or vice versa when the pressure on lever M is withdrawn or applied, instantly discharging the coin or other substance that may have been directed into the coin chute, when the pressure of lever M is withdrawn. One edge of the base has an inner flange or projection which is cut away between its ends as shown to provide for the reception and the operation of the lever Q.

P is the rigid arm or bracket used as described in foregoing paragraph, held in place by screws or other fastening and supports cap O by the pin o working in a bearing provided therein at a corresponding angle to that of said pin o . The end of the bracket containing the bearing is so curved outward, or might be filed on its inner edge to the same angle, as to reduce friction to a minimum on the shoulder of the pin o .

R is a guide fastened to the base N and so constructed as to permit the forward and lateral motion of the front wall O of the chute and guide the said wall or cap on its return to the position shown in Fig. 1 for which the angle r is appropriately made. This apparently simple guide is an indispensable part of the mechanism.

M is a lever constructed as shown and adapted to press against the edge of the cap or front wall O to hold the said cap in the position shown in Fig. 1 and in full lines in Fig. 7 of the drawings or return it to such position when by the trip action of the mechanism it has permitted the said cap to swing open and

discharge the coin. The lever is held in an operative position by the weight m which is attached to the horizontal member of the said lever M.

S S are two terminals of the wires leading from an electric battery C or other electrical source, and are made of copper or other metal of proper electrical conductivity. Both terminals have broad flattened ends which when the machine is not charged with a coin do not touch. One terminal is rigidly fastened; the other terminal is constructed to form a spring which is driven and held against the rigid terminal when the coin is received in the chute, thus closing the electrical circuit and conveying the power to the electrical motor of the phonograph. The position of the terminals is maintained until the coin is discharged by the action of trip lever L hereinbefore described, when the terminals separate and break the electrical circuit.

Q is a lever pivoted at its upper end to the base N and is provided on its outer face with insulating material q which is in engagement with the movable terminal. The lower end of the lever curves in at q' to further retain the coin in the chute. The operation of the coin in connection with this lever Q is as follows: The coin enters through a tube or other suitable guide T at the receiving slot t . The weight m attached to lever M holds the cap in a normal position and the return edge or portion o' being on the edge opposite the return portion n on the base N forms a perpendicular wall for the coin chute. The lever Q by the action of the spring terminal S and by reason of the location of the pivot hangs at an incline to the perpendicular and forms with the perpendicular wall o' a slightly converging chute. The coin by its weight and particularly by the force acquired in its passage through the tube or guide T crowds the lever Q outward against the spring terminal with sufficient force to form a perfect electrical contact, which is maintained by the continuous wedging action of the coin until it has become firmly locked between the curved end q' and the perpendicular wall. The distance between the perpendicular wall o' and the curved end q' is such that a penny or other coin smaller than a nickel passes completely through the chute without crowding the lever to point of contact.

The release of the coin and the consequent stoppage of the mechanism by means of the levers L and M, have been explained in other paragraphs.

The difficulty with many slot attachments, of getting an electrical contact that is reliable enough to operate the phonograph at all times during the entire reproduction of the record with sufficient steadiness not to affect the said reproduction is here obviated, because I do not depend alone on the weight of the coin but not generally reliable thereafter. I obtain a positive contact in the way described, using not only the coin but taking and hold-

ing the power of its blow on the wires through the weighted lever M, during the entire reproduction of the record thus practically making a complete binding post when each nickel or other coin of proper denomination goes in.

The great objection to coin operated mechanisms for phonographs generally is that they do not raise and lower the diaphragm of the phonograph without some concussion. By means of the cam roller or flat bar I do this more gently than the hand can raise or lower it. This is essential to the successful use of the phonograph.

I do not take any power off the small one hundred thread feed screw *b* of the phonograph, the action of the pawl J being on a balanced wheel and cam roller as described that carries no weight until after the friction gear *e*³, has engaged mutilated gear G by the action of shaft E which gets its power from the phonograph in the manner hereinbefore set forth.

The trip lever L is so located from right to left that the machine has several seconds of time for the governor of the phonograph to steady its speed before the mechanism lets down the diaphragm on the record and hence the first reproduction of the phonograph is as perfect as the last.

The instant and accurate adjustment to the length of the phonographic record by the stops *h h* is an important element of the invention in that it adapts the mechanism to records of varying lengths.

During the forward travel of the phonograph, which is the period of reproduction, the phonograph is as completely and perfectly detached from and independent of the diaphragm controlling mechanism as if there were no such attachment, and hence can be neither retarded, impeded, nor affected by it.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a phonograph and the mechanism which actuates it, of an interposed shaft driven from said mechanism, a shifting clutch mechanism actuated from the carriage and a carriage lifting device controlled by said clutch mechanism, substantially as described.

2. The combination with a phonograph, its motor, and a circuit in which the motor lies, of a circuit breaker, connected with the phonograph-carriage, and mechanism for raising the diaphragm, and reversing the carriage, said raising and reversing mechanism being actuated from the main shaft of the instrument, substantially as specified.

3. In a coin operated mechanism for phonograph the combination with the diaphragm and feeding mechanism for carrying the diaphragm over the record, of a screw threaded shaft operated from the phonograph and adapted to move the diaphragm over the record to a starting point and to a normal position, a cam roller, a mutilated gear on the

cam roller, a friction roller on the said screw threaded shaft, a sliding rod constructed to be operated by the diaphragm, a rock shaft actuated by means of the said sliding rod, a pawl carried by the rock shaft and adapted to give an initial movement to the said mutilated gear, a coin chute, electrical terminals actuated by the passage of the coin through the said chute, to complete the circuit, and electrical circuit, and an electric motor included in the said circuit, substantially as and for the purpose described.

4. In a coin operated mechanism for phonograph the combination with the diaphragm and feeding mechanism for carrying the diaphragm over the record, of a screw threaded shaft operated from the phonograph and adapted to move the diaphragm over the record to a starting point and to a normal position, a cam roller, a mutilated gear on the cam roller, a friction roller on the said screw threaded shaft, a sliding rod constructed to be operated by the diaphragm, adjustable stops on the sliding rod, a rock shaft actuated by means of the said sliding rod, a pawl carried by the rock shaft and adapted to give an initial movement to the said mutilated gear, a coin chute, electrical terminals actuated by the passage of the coin through the said chute to complete the circuit and electrical circuit, and an electric motor included in the said circuit, substantially as and for the purpose described.

5. In coin operated mechanism for phonograph the combination with the diaphragm and feeding mechanism for carrying the diaphragm over the record of a screw threaded shaft operated from the phonograph and adapted to move the diaphragm over the record to a starting point and to a normal position, a cam roller, a mutilated gear on the cam roller, a friction roller on the said screw threaded shaft, a sliding rod constructed to be operated by the diaphragm, a rock shaft having an arm projected therefrom, a fork connected with the sliding rod and adapted to engage with the said arm a pawl carried by the rock shaft and adapted to give an initial movement to the said mutilated gear, a coin chute, electrical terminals actuated by the passage of the coin through the said chute to complete the circuit, and electrical circuit, and an electric motor included in the said circuit, substantially as and for the purpose described.

6. In a coin operated mechanism for phonographs the combination with the diaphragm and feeding mechanism for carrying the diaphragm over the record, of a screw threaded shaft operated from the phonograph and adapted to move the diaphragm over the record to a starting point and to a normal position, a lever pivotally connected with the diaphragm arm, a cam roller, mechanism for operating the cam roller to disconnect the diaphragm from the phonograph feeding mechanism and effect connection between it and

the said screw threaded shaft, a coin chute, electrical terminals actuated by the passage of the coin through the said chute to complete the circuit, and electrical circuit, and an electrical motor included in the said circuit, substantially as and for the purpose described.

7. In coin operated mechanism for phonograph the combination with the diaphragm and feeding mechanism for carrying the diaphragm over the record, of a screw threaded shaft operated from the phonograph and adapted to move the diaphragm over the record to a starting point and to a normal position, a lever D pivotally connected with the diaphragm arm and having a point, a coin actuated mechanism, a trip lever having a portion projected within the path of the point of the said lever D and constructed to release the coin, a cam roller, mechanism for operating the cam roller to disconnect the diaphragm from the phonograph feeding mechanism and effect connection between it and the said screw threaded shaft, a coin chute, and terminals actuated by the passage of the coin through the said chute to complete the circuit, and electrical circuit, and an electric motor included in the said circuit, substantially as and for the purpose described.

8. In coin operated mechanism for phonograph the combination with the diaphragm and feeding mechanism for carrying the diaphragm over the record, of a screw threaded shaft operated from the phonograph and adapted to move the diaphragm over the record to a starting point and to a normal position, a lever D pivotally connected with the diaphragm arm and having a point, a coin actuated mechanism, a trip lever having a portion projected within the path of the point of the said lever D and constructed to release the coin and terminals to close the circuit when the coin is dropped in and automatically separate after the coin is released, and electrical circuit, and an electric motor included in the said circuit, substantially as described.

9. In coin actuated mechanism the combination with the base N, of the cap O pivotally connected with the base by a pivot arranged obliquely thereto, said cap adapted to swing outwardly and laterally and forming with the base the coin chute, substantially as described.

10. In coin operated mechanism the combination with the base, and the cap pivotally connected with the base by a pivot arranged obliquely thereto, said cap adapted to swing outwardly and laterally, of the pivoted lever

Q having the curved end q' , substantially as and for the purpose described.

11. In coin operated mechanism the combination with the base and the cap pivotally connected with the base by a pivot arranged obliquely thereto, said cap adapted to swing outwardly and laterally, of the guide R having the inclined portion r , substantially as and for the purpose described.

12. In coin operated mechanism the combination with the base N, and the cap O pivotally connected with the base by a pivot arranged obliquely thereto, said cap adapted to swing outwardly and laterally of the weighted lever M constructed to hold the cap in operative relation with the base, substantially as set forth.

13. In coin operated mechanism the combination with the base N, and cap O pivotally connected with the base, and adapted to swing outwardly and laterally, of the pivoted lever Q having the curved end q' , and the weighted lever M constructed to hold the said cap in operative relation with the said base, substantially as described.

14. In coin operated mechanism for phonographs the combination of the diaphragm feeding mechanism for carrying the diaphragm over the record, a screw threaded shaft operated from the phonograph a lever D having pivotal connection with the diaphragm arm, and having a point, d , a cam roller for effecting engagement and disengagement of the lever D with the said screw threaded shaft and gearing and ungearing the diaphragm feeding mechanism, a friction pulley on the screw threaded shaft, a mutilated gear on the cam roller to be actuated by the said friction pulley, the sliding rod H, adjustable stops on the said rod, the spring actuated rock shaft having arm k , a fork secured to rod H and adapted to depress arm k , and rock the shaft K, the pawl J carried by the rock shaft and adapted to impart an initial movement to the said mutilated gear, trip lever having end l extended within the path of the point d , the weighted lever M connected with the trip lever L, the coin chute having the cap O adapted to swing outwardly and laterally, the lever Q having a curved end q' , and the terminals S S, substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE E. TEWKSBURY.

Witnesses:

SIMON S. OTT,

E. STAUFFENBERG.

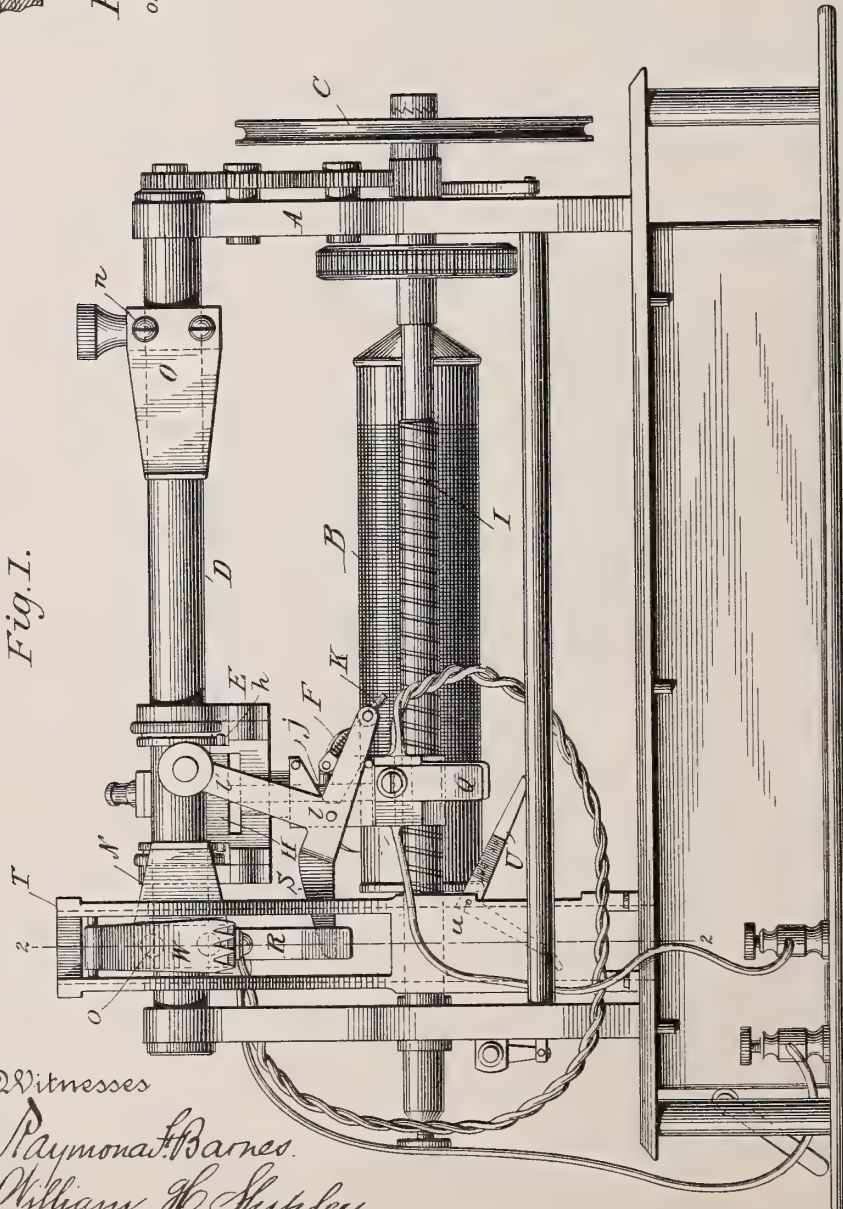
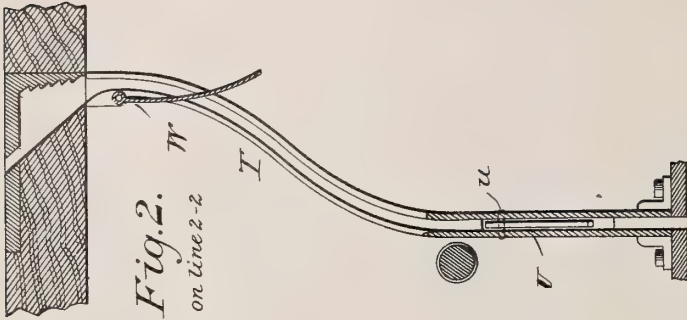
(No Model.)

2 Sheets—Sheet 1.

T. H. MACDONALD.
COIN CONTROLLED PHONOGRAPH.

No. 523,748.

Patented July 31, 1894.



Witnesses

Raymond Barnes.
William H. Shipley

Inventor
T. H. Macdonald,
By P. T. Lodge
Attorney

(No Model.)

2 Sheets—Sheet 2.

T. H. MACDONALD.
COIN CONTROLLED PHONOGRAPH.

No. 523,748.

Patented July 31, 1894.

Fig. 3.

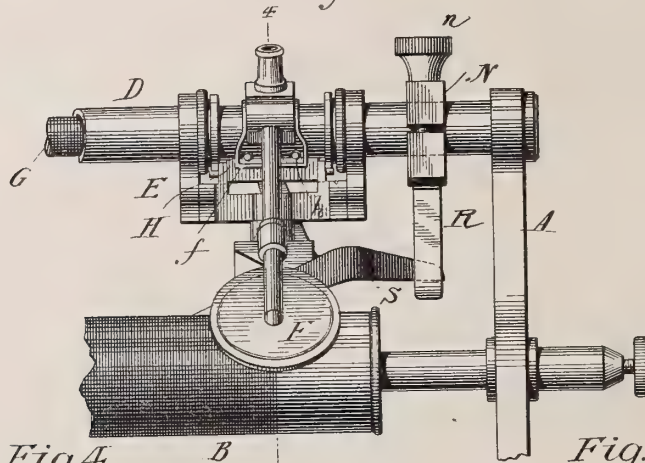


Fig. 4.
on line 4-4.

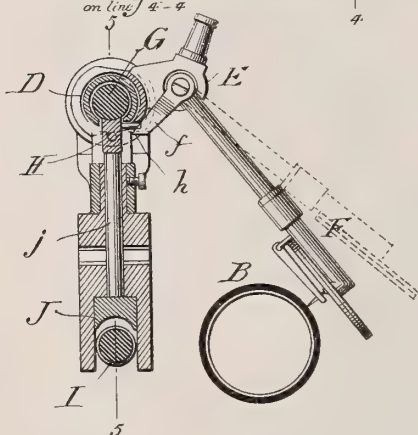


Fig. 5.
on line 5-5.

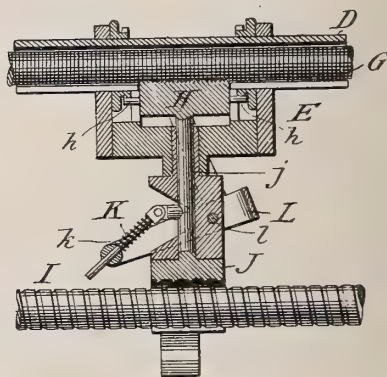
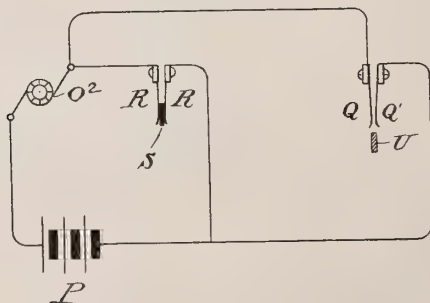


Fig. 6.



Witnesses

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William H. Shipley.

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T. H. Macdonald
By O. T. Lodge
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UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT.

COIN-CONTROLLED PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 523,748, dated July 31, 1894.

Application filed December 31, 1891. Serial No. 416,622. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, county of Fairfield, and State of Connecticut, have invented a new and useful Improvement in Coin-Controlled Phonographs, of which the following is a specification.

This invention has reference to coin-actuated devices for controlling the operation of a graphophone, phonograph or equivalent instrument.

In accordance with my invention the machine is operated in any ordinary or approved manner by an electric motor in a normally open circuit containing a battery or other source of electric energy. When a suitable coin is introduced it momentarily closes the circuit to initiate the operation of the machine. As the machine begins its operation it closes the circuit through a shorter course, at the same time, opening it at the first point. The closure through the second or shorter course is maintained until the machine has reproduced the entire record and the parts have returned to their normal or starting position when the circuit is again automatically opened.

It is the arrangement of mechanism for automatically effecting the above described action that constitutes the essence of my invention. I have also combined with automatic devices means for effecting quick restoration of the parts to their normal or starting position after they have reproduced the entire record.

My improvements are susceptible of embodiment in various forms, and are applicable alike to the instrument known in the art as the "graphophone," to the phonograph, and to other machines or instruments of similar character.

For purposes of illustration I have shown the improvement applied to the graphophone.

In the accompanying drawings,—Figure 1 is a side elevation of a machine containing my improvement. Fig. 2 is a vertical cross-section on the line 2—2 in Fig. 1. Fig. 3 is a side elevation of the carriage and attendant parts. Fig. 4 is a cross-section on the line 4—4 in Fig. 3. Fig. 5 is a vertical longitudinal section on the line 5—5 in Fig. 4. Fig. 6 is a diagram illustrating the circuits.

Referring to the drawings,—A represents the rigid main-frame; B, a horizontal cylinder commonly known as the "record cylinder," having a continuous spiral groove formed in its outer surface. This cylinder is sustained by the usual revolving supports rotated through intermediate gear from a driving pulley C, in the usual manner, represented in numerous patents heretofore granted.

D represents a horizontal tubular guide fixed in the top of the frame, serving to sustain the carriage E, to which the gravitating diaphragm frame F, is hinged as usual, so that as the carriage moves along the guide the style will ride in the record groove and impart to the diaphragm movements such as to reproduce the recorded sounds in a manner well understood in the art. The advance of the carriage slowly along the guide and cylinder is effected by means of a feed screw G, mounted within the guide D, and engaging a vertically-movable segmental nut H, mounted in the top of the carriage and vertically-adjustable. The feed-screw G, is connected at one end with the driving-gear so that the screw receives a slow motion constantly in one direction.

For the purpose of effecting a quick return movement of the carriage I provide a second feed-screw I, mounted longitudinally in the frame and geared at one end to the driving-train. This second screw is provided with a thread of rapid pitch arranged to engage a vertically-movable nut J, connected with the upper nut H, by a vertically-sliding stem or rod j, so that when the upper nut is depressed and disengaged from the upper screw the lower end is engaged with the top of the lower screw, which is so driven as to move the carriage rapidly downward to the starting-point, carrying with it the diaphragm-frame so that it will be in position to commence operations anew.

It is obvious that during the return movement of the carriage the diaphragm-frame must be lifted and upheld to keep the style out of the record groove. This is effected, as shown in Figs. 3 and 4, by providing the hinged arm which carries the diaphragm-frame with a laterally-projecting member f, in the shape of a stirrup and providing the upper nut H, with laterally-projecting studs

h, so that when the upper nut is depressed and disengaged from the feed-screw, preparatory to the return of the carriage, the nut H, acting on the stirrup f, will throw the diaphragm frame upward, as indicated in dotted lines, and thus hold the style above and out of contact with the cylinder during its return movement thereover. When the nut is again raised to engage the feed-screw it permits the diaphragm frame to fall to its operative position. The nuts are held in their upper and lower positions alternately by the devices shown in Fig. 5, in which K represents a small stem or spindle pivoted to the stem which connects the nuts and projected through one end of a stirrup L, mounted on a horizontal pivot l, passing through the carriage. A spiral spring k, encircling the spindle K, and bearing within the end of the stirrup acts, when the end of the stirrup is depressed, as shown in full lines in Fig. 5, to hold the nuts upward, or when the end of the stirrup is elevated to press the nuts downward. This action will be readily understood when it is observed that the motion of the stirrup raising and lowering the outer end of the spindle K, changes its inclination so that the spring will press upward or downward upon the nuts. This shifting of the nuts it will be seen, reverses the motion of the carriage without reversing or stopping the action of the screws or driving gear.

The reversing action is rendered automatic by means of stops N and O, fixed on the horizontal guide in position to encounter a roller on the end of an upreaching arm l', of the stirrup L, as plainly indicated in Fig. 1. As the carriage returns to its normal position as shown at the left hand in Fig. 1, the roller encounters the stop N, and as the carriage continues its movement to the left the stirrup L is caused to turn over on its center until the spring finally "passes the center," whereupon the movement is continued by the spring so as to throw the upper nut into action and the lower nut out of action, leaving the machine in position to begin the record. As the machine moves to the right the roller encounters the stop O, by which the position of the stirrup is reversed, and the upper nut disengaged, the diaphragm-frame lifted and the lower nut engaged to effect the automatic return of the carriage. The stops N and O are both divided transversely and provided with contracting or binding screws n and o, where- by they may be fixed in position at any suitable point in the length of the guide N. In this way the distance through which the carriage moves and the points at which its action begins and ceases may be controlled at will according to the length of the record upon the cylinder.

Passing now to the electric connections it is first to be noted that an electric motor of any suitable form may be employed and belted directly to the driving-pulley C, or otherwise connected to the machine.

Referring to Fig. 6, O² represents a motor

contained in a circuit which includes a battery or generator P, and two terminal springs Q and Q', which stand normally out of contact so that the circuit is open at this point. Within the main circuit there is a secondary shunt or short circuit terminating in two spring fingers R R', which tend to close together against each other and keep the circuit closed through the motor. When the carriage is at the starting point an insulated finger S, on the stirrup L, projects between the contact fingers R R', and holds the circuit open so that it stands open normally at two points. Within or adjacent to the main-frame there is fixed a skeleton tube or guide T, adapted to receive and conduct into a receptacle below a coin of predetermined size. Near the bottom of this tube and projecting at one end into the same there is an angular finger U, mounted on a pivot u, and having its outer end formed of conducting material. When a coin is dropped into the tube it acts against and depresses the inner end of finger U, causing its outer end to rise between the fingers Q Q', and thus close the circuit through the motor to start the machine. The fingers Q Q' are mounted on the carriage so that as the latter advances the fingers Q Q' are carried away from the finger U, and the original circuit thus opened. Before this occurs, however, the insulated finger S, moving with the carriage, is drawn from between the fingers R, which are thus allowed to close together so as to establish the new and shorter circuit through the motor. This circuit remains closed until the carriage has moved outward and returned. As the carriage completes its return movement the stirrup L being tilted over to the position shown in Fig. 1, to reverse the feed, at the same time lifts the finger S, upward between the conductors R, thus opening the circuit. During the earlier part of the advance of the carriage and while the fingers Q are still in contact with the lever U, they hold the latter in such position as to prevent the coin from passing below it. The moment, however, that the fingers Q are carried beyond the lever U, the latter is permitted to fall at its inner end and allow the coin to pass onward into the receptacle below.

In order to prevent the fraudulent extraction of the coin after its introduction into the tube to prevent coins of improper sizes from setting the machine in action I make the tube T, as before mentioned, of skeleton form, that is to say, I cut away its front and rear walls longitudinally at the upper end through the middle, so as to leave only the portion necessary to receive and guide the edges of the coin. If the coin be of less than the proper diameter it will escape from the tube before reaching the finger U. Near the top of the tube, which is inclined laterally, I pivot a gravitating plate W, the lower end of which is toothed or serrated and arranged to hang through the opening in the tube. This plate

will yield readily and pass out of the way of descending coin. If, however, an attempt be made to extract the coin by means of a cord the latter will enter between the top of the plate and the coin carried behind the plate so as to prevent its outward passage.

Having thus described my invention, what I claim is—

1. In a coin-actuated phonograph, the combination with the traveling carriage for the reproducer, of two electrodes arranged in proximity to each other on said carriage and constituting the terminals of a circuit for the actuating motor, a relatively stationary coin-actuated lever adapted to make contact with and complete the circuit through said electrodes, said circuit being broken by the movement of the electrodes away from contact with said lever, substantially as described.

2. In a coin-actuated phonograph the combination with the traveling carriage for the reproducer, of two electrodes arranged in close proximity to each other on said carriage and constituting the terminals of a primary circuit for the actuating motor, a relatively stationary coin-actuated lever adapted to make contact with and complete the primary circuit through said electrodes, said circuit being broken by the movement of the electrodes away from contact with said lever, and a secondary circuit for the actuating motor which is completed simultaneously with the breaking of the primary circuit, substantially as described.

3. In combination with a phonograph having a movable carriage, a circuit including the motor spring contact fingers in said circuit, and an insulated arm on the carriage arranged to enter between and separate said contact fingers as the carriage returns to the starting-point.

4. In combination with a phonograph having a movable carriage, the motor circuit terminating in fingers R R', normally in contact with each other the finger S mounted on the carriage in position to enter between said fingers on the return of the carriage to open the circuit and hold the same open.

5. In combination with a phonograph having a movable carriage, a primary motor circuit with terminals on the carriage, the coin-operated lever U to temporarily close said circuit, the secondary motor circuit terminating in stationary fingers R R', and a finger S mounted on the carriage to open the secondary circuit.

6. In a phonograph the combination with the traveling carriage and feed and return screws, of two nuts, one for each of said screws, through which motion is transmitted to the

carriage and an actuating spring for pressing said nuts alternately into engagement with the respective screws, substantially as described.

7. The combination with the feed and return screws, of two nuts, one for each of said screws, carried by a common stem, a spring acting upon said stem to alternately engage said nuts with the screws, respectively, and means for changing the position of and releasing said spring to exert its tension in different directions, substantially as described.

8. The combination with the feed and return screws and the traveling carriage, of two nuts, one for each of said screws, carried by a common stem, through which screws motion is transmitted to the carriage, a spring acting upon said stem, and a tilting stirrup for changing the position of and releasing said spring to alternately snap said nuts into engagement with their respective screws, substantially as described.

9. The combination with feed and return screws and a traveling carriage, of two nuts, one for each screw, adapted to alternately engage with the screws respectively, of a stirrup on the carriage and means for tilting said stirrup to change the position of the nuts, substantially as described.

10. The combination with the carriage, feed and return screws and nuts for engagement with the screws, of a pivoted stirrup, an actuating spring between said nuts and stirrup, and stops for tilting said stirrup to alternately engage said nuts with the screws respectively, substantially as described.

11. The combination with the reproducer having a depending stirrup at the pivoted end thereof, of a pin or projection engaging in said stirrup and lifting the reproducer from the phonogram when the carriage is actuated by the return screw, substantially as described.

12. In a phonograph the combination with the traveling carriage, the feed and return screws, and the connected nuts adapted to be thrown alternately into and out of engagement with the respective screws, of the pivoted stirrup L and the spring between said stirrup and nuts adapted to hold the latter in either position, according to the position of the stirrup.

In testimony whereof I hereunto set my hand, this 23d day of November, 1891, in the presence of two attesting witnesses.

THOMAS H. MACDONALD.

Witnesses:

E. A. FARGO,

CHAS. K. THOMPSON.

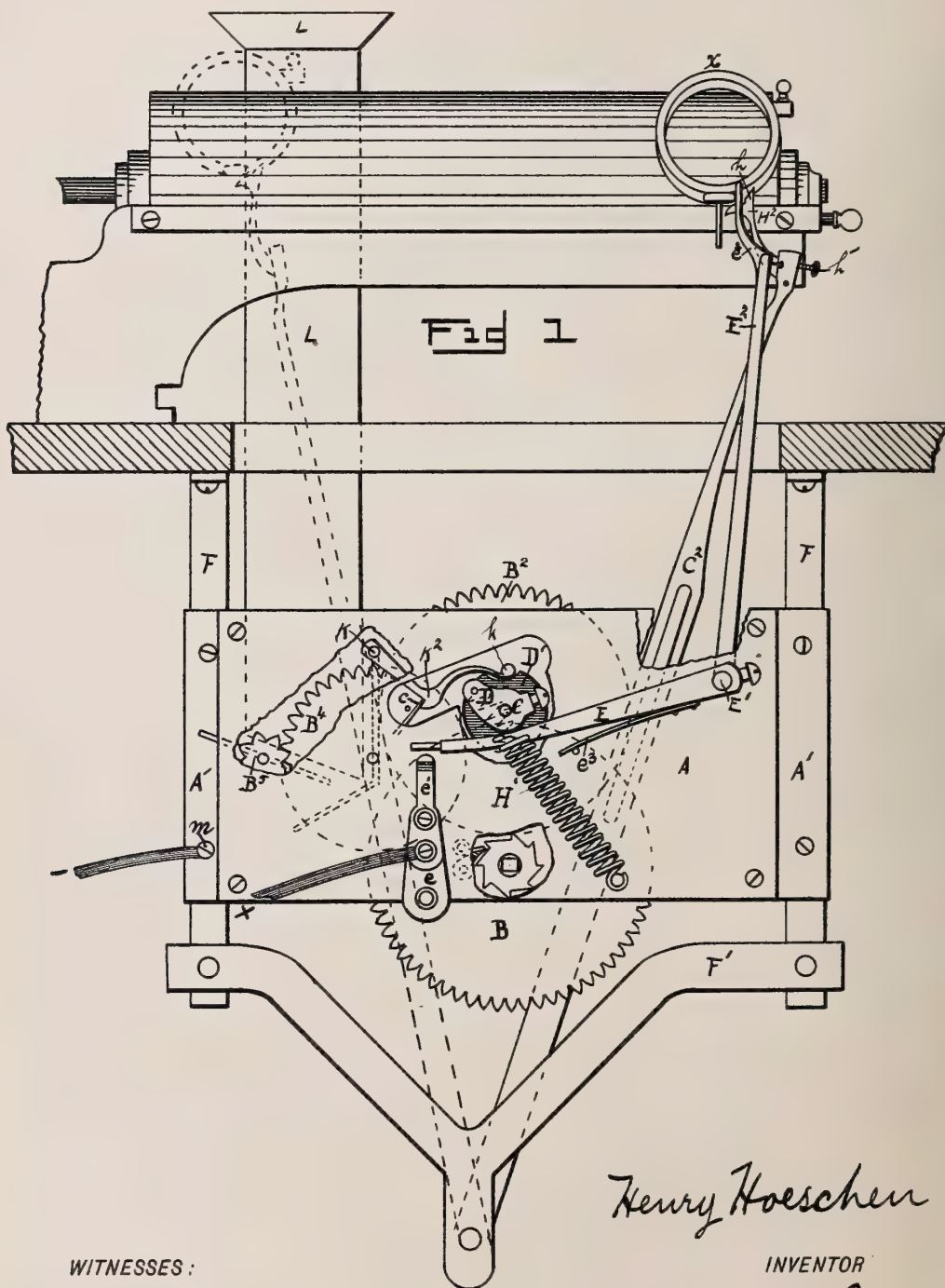
(No Model.)

2 Sheets—Sheet 1.

H. HOESCHEN.
PHONOGRAPH RETURN CARRIAGE.

No. 524,761.

Patented Aug. 21, 1894.



WITNESSES :

H. S. Mann.
E. Fay.

INVENTOR

BY *W. M. Sues.*
ATTORNEY.

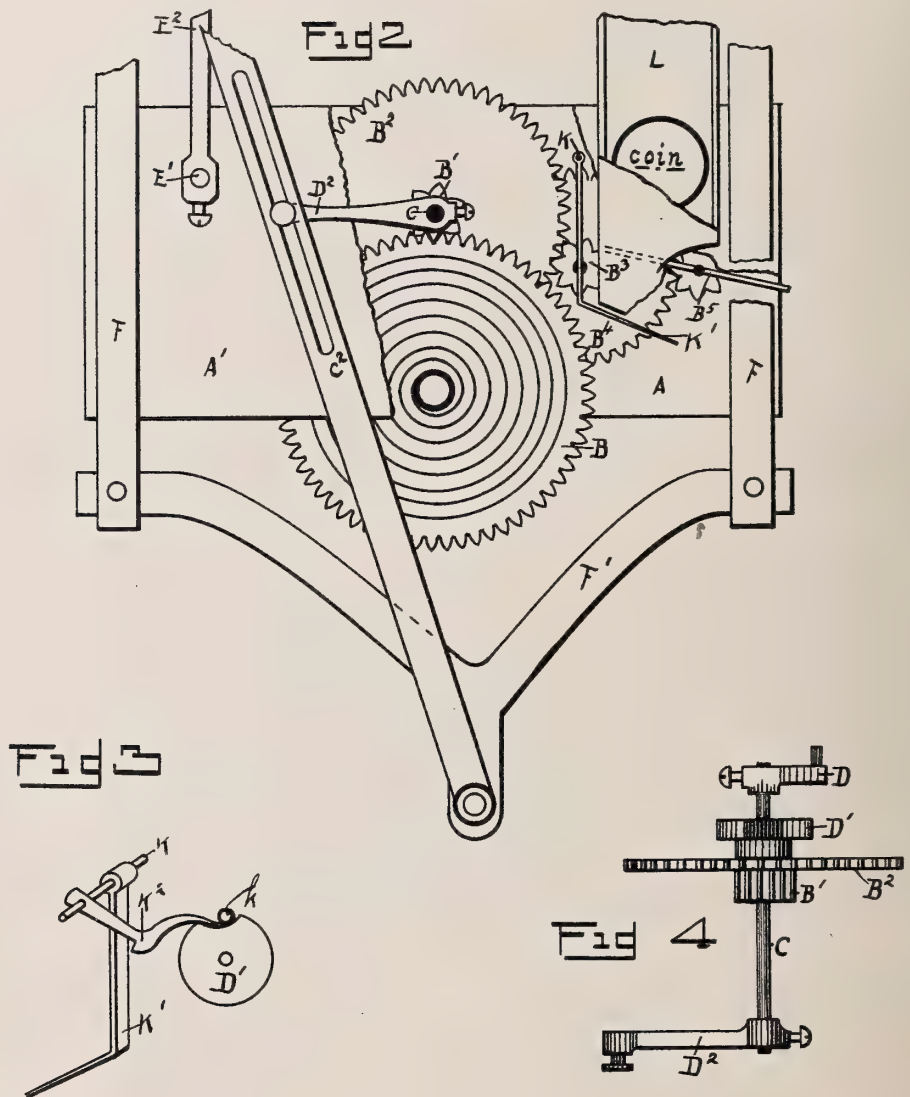
(No Model.)

2 Sheets—Sheet 2.

H. HOESCHEN.
PHONOGRAPH RETURN CARRIAGE.

No. 524,761.

Patented Aug. 21, 1894.



Henry Hoeschen

INVENTOR

WITNESSES:

N. S. Mann.
E. Fay.

BY

E. M. Sues.
ATTORNEY.

UNITED STATES PATENT OFFICE.

HENRY HOESCHEN, OF OMAHA, NEBRASKA.

PHONOGRAPH RETURN-CARRIAGE.

SPECIFICATION forming part of Letters Patent No. 524,761, dated August 21, 1894.

Application filed February 17, 1892. Serial No. 421,820. (No model.)

To all whom it may concern:

Be it known that I, HENRY HOESCHEN, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain useful Improvements in Phonograph Return-Carriages; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to an automatic coin actuated return carriage for phonographs, adapted to operate independent of the phonograph mechanism.

The object of my invention is to provide a motor mechanism for phonographs, that shall be adjustable and operate automatically, and be adapted to return the diaphragm carriage to its normal position, at any suitable point or instant, and in furtherance of this object, the invention consists in the construction, combination and arrangement of parts, as hereinafter more fully described.

In the accompanying drawings, Figure 1 shows a front elevation, with parts broken away, of my improved coin-operated motor mechanism. Fig. 2 represents a rear view of the train of gearing; Fig. 3 a view of the coin lever and cam, and Fig. 4 detail of the main cam shaft.

A, A', represent the front and rear plates supporting a suitably timed train of clock work comprising the spring actuated main driving gear B and the connecting pinion B' and gear B², pinion B³, gear B⁴ and the fan governor B⁵.

The gear B is an ordinary spring actuated pawl and ratchet controlled gear, meshing with the pinion B', forming part of the gear B², both of which are mounted upon the centrally positioned cam shaft C. This main driving shaft shown in detail in Fig. 4, projects beyond the face on both sides and is provided in front with the cam D next with the mutilated disk D', intermediately with the gear B², and pinion B', and at its remaining projecting end at the rear, with an extending crank arm D², which works within an elongated slot within the carriage lever C², as illustrated in Fig. 2. Riding below and against the cam D is the spring actuated circuit lever

E, which is mounted upon a suitable shaft E' and provided with a stop arm E², which is held adjustably upon said shaft. The bar E is provided with a projecting nose, which is made to ride between the spring ends of the circuit plates *e, e'*, when the lever is forced downward by means of the driving cam D. The plates *e, e'* are insulated from the plate A, by means of a block of rubber, and are connected to one of the poles of the battery connected to the phonograph motor. The operating arm E² projects upward, and is provided with a screw regulated tip *e*², which is adapted to reciprocate in the path of the diaphragm carriage *x*, as shown in Fig. 1. Below the circuit lever E, is provided with the spring *e*³ to insure its riding against the cam D.

The gear B⁴, which is on the same shaft with the pinion B³ meshing with the gear B² is provided with a spring *c*, as shown in Fig. 1, which operates as a stop, in checking the operation of the motor. Meshing with this gear B⁴, is the fan governor B⁵, regulating the speed of the gearing.

The clock case A, A' is mounted below the phonograph, and is supported by means of the brackets F, F, provided with a transverse brace F', to the lower end of which is pivoted the carriage lever C², as illustrated. This lever is operated by means of the crank arm D² attached to the shaft C upon the rear side as stated.

In front, the face plate A is provided with a spring H', which is connected to said face plate by means of a pin and connected at its upper end to the cam D, and aids in operating the cam.

The carriage lever C², is provided at its upper end with an adjustable curved carrier H² provided with a stirrup *h* adapted to engage the projecting end of the diaphragm carriage *x*, and centrally with a slot, within which the pin of the crank D² is adapted to reciprocate, in operating the lever.

The carrier is pivoted within the bifurcated end of the carriage lever C², and being curved, and pivoted to one side of its medial line, is permitted certain radial motion. In the rear the carrier is provided with an adjustable stop screw *h'* which limits the movement of said carrier. The diaphragm actuated operating arm E², normally positioned, is adjoining the carriage lever C².

The device is brought into electric circuit

with the phonograph motor by having one of the poles secured to the screw *m*, in connection with its metallic clock casing and the other to the circuit plates *e*, *e'* as shown, the lever E breaking and closing the circuit.

Mounted upon an independent shaft K, is the coin lever K', shown in Fig. 3, which is provided with the hooked stop arm K², ending in the curved nosing *k*, which nosing is adapted to ride upon the mutilated disk D', while the hooked arm K² operates in the path of the spring *c* of the gear B⁴, as shown in Fig. 1. The coin lever K', has a lower bent portion, which extends into the path of the coin chute L, as shown in Fig. 2.

When all the parts have been properly arranged and adjusted, the operation of my device is as follows: The clock work is set, previous to its initial movement, so that the stop K² rides against the spring *c*, and thus locks the train of gearing as illustrated in Fig. 1. The operator in order to start the phonograph, drops a nickel into the coin chute, which in descending, strikes the bent end of the coin lever K', and this lever in turn carries the connected hooked stop K² out of the path of the spring stop *c*, permitting the escape of said spring, and thus starting the motor. At the first instant both the carriage lever H and the stop arm E², are carried forward, the first being operated by the crank D² and the latter by the connected circuit lever E, which lever is forced downward by the cam D, thus promptly closing the circuit, and starting the electric motor driving the phonograph cylinder. The lever E is securely impinged and held between the spring ends, of the circuit plates *e*, *e'*, while the cam D continues to revolve. As soon as the carriage lever H moves forward, the carrier H² engages the diaphragm carriage, and raising it upward speedily carries it to the forward and starting point, where the carriage will escape from the carrier, which with the carriage arm, will again be returned to its first position. By this time the mutilated portion of the disk D', will have arrived at its position at starting, so that the nosing *k* of the stop arm will ride into the depression, and so permit the hooked stop arm K² to drop into the path of the spring *c*, and thus stopping the independent carriage motor. However the circuit has been closed by means of the lever E, and the electric motor is gradually threading the diaphragm carriage forward, until it comes into collision with the projecting stop arm E², and in carrying the arm backward, will force the circuit lever E upward and from between the circuit plates *e*, *e'*, and thus break the electric connection, and stop the movement of the motor. At this instant, the position of the return carriage will be in the position, as illustrated in Fig. 1. The device will again be started by dropping another nickel into the chute.

The movement of the carriage lever may be

nicely timed, so that it will make a long or short haul to either side of a vertical medial line passing through the center of the phonograph cylinder.

The movement of the diaphragm carriage beyond the medial line, is regulated by means of the adjustable stem of the operating arm E², while that before, by means of the adjustable carrier H².

Having thus described my said invention, what I claim as new, and desire to secure by United States Letters Patent, is—

1. In a return carriage for phonographs, the combination with a suitably timed train of gearing in electric circuit with a phonograph, of a carriage lever operated by said gearing, and adapted to engage the diaphragm carriage of said phonograph, and a cam actuated circuit lever adapted to work against an insulated terminal, to close the circuit, all substantially as and for the purpose set forth.

2. In a return carriage for phonographs the combination with a suitably timed train of gearing in electrical circuit with a phonograph, of a carriage lever operated by said gearing, and adapted to engage the diaphragm carriage of said phonograph, a cam actuated circuit lever provided with a projecting stop arm, said circuit lever being operated by a cam in closing, and the diaphragm carriage in breaking the electric circuit, all substantially as and for the purpose set forth.

3. In a return carriage for phonographs, a suitably timed train of gearing in electric circuit with the phonograph, comprising a spring actuated main driving gear, a cranked cam shaft, provided with a gear and pinion and a mutilated disk, a meshing gear and pinion provided with a projecting stop, and a coin operated lever provided with a hook and nosing, the first adapted to engage the said projecting stop, and the nosing being adapted to ride upon said mutilated disk, to stop and start said train of gearing, all substantially as and for the purpose set forth.

4. In a return carriage for phonographs, the combination of the following instrumentalities, to wit: a clock casing provided with a main driving gear, a cam shaft having a gear and pinion meshing with said driving gear, and further provided with a cam, mutilated disk and a crank arm, a coin operated lever having a hook and nosing, the latter adapted to ride upon said mutilated disk, and a gear meshing with the gear of said cam shaft, and provided with a spring, adapted to be engaged by the hooked coin operated lever, to start and stop said train of gearing, all substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY HOESCHEN.

Witnesses:

HERBERT L. MANN,
G. W. SUES.

(No Model.)

2 Sheets—Sheet 1.

G. T. WALDRON.

COIN RELEASED ACTUATING MECHANISM FOR PHONOGRAPHS.

No. 524,921.

Patented Aug. 21, 1894.

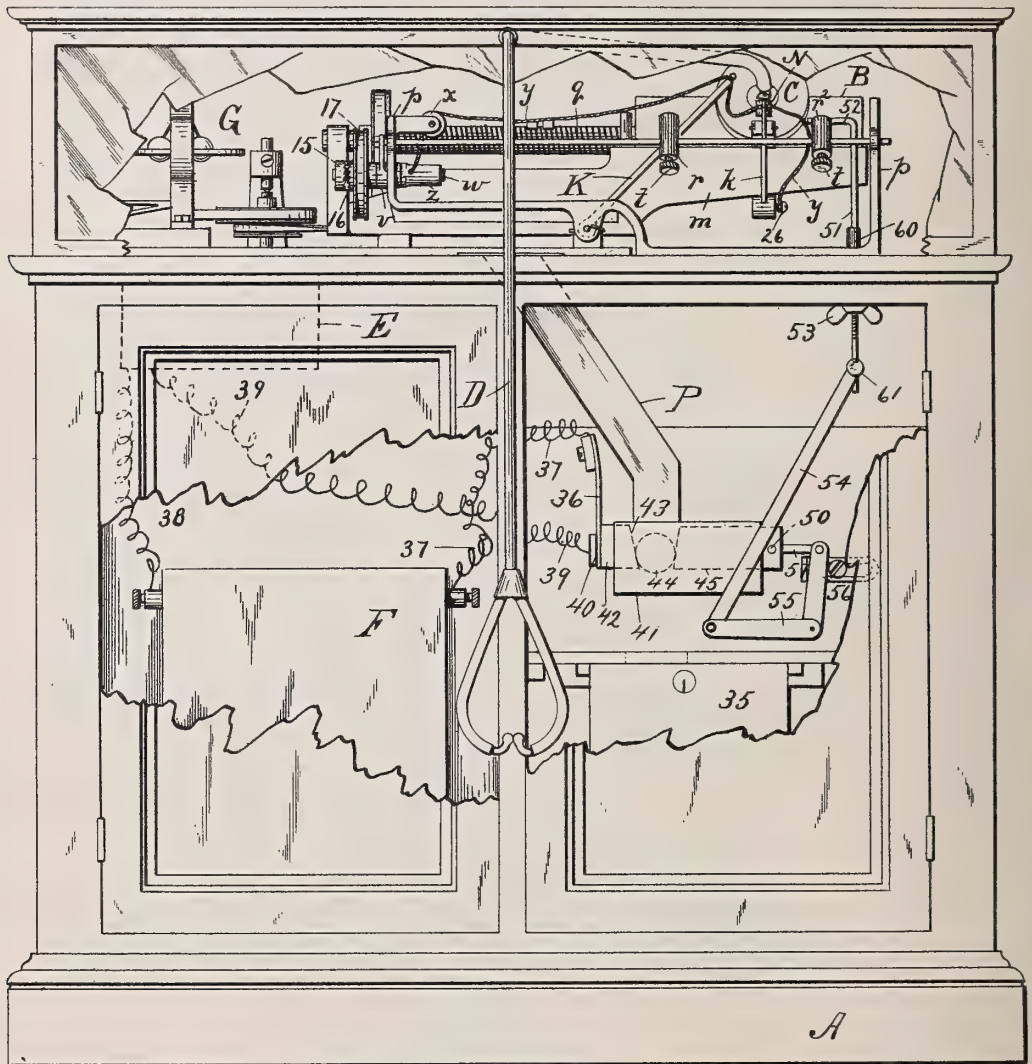


Fig. 1.

WITNESSES
 E. M. Kimball
 A. D. Jones

INVENTOR
George T. Waldron,
By C. A. Shawles,
ATT'YS

(No Model.)

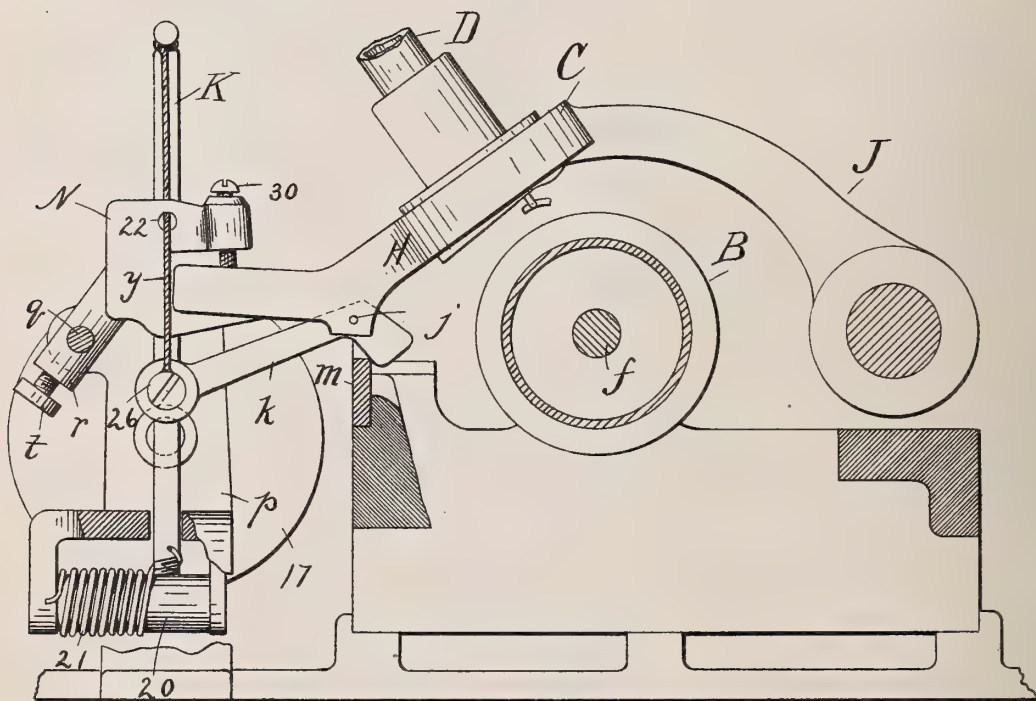
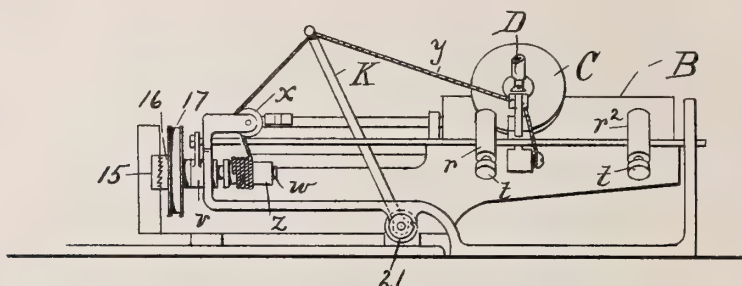
2 Sheets—Sheet 2.

G. T. WALDRON.

COIN RELEASED ACTUATING MECHANISM FOR PHONOGRAPHS.

No. 524,921.

Patented Aug. 21, 1894.



WITNESSES
C. Kimball
A. Duffer

INVENTOR
George T. Waldron
By C. A. Shaw & Co.
ATTYS

UNITED STATES PATENT OFFICE.

GEORGE T. WALDRON, OF QUINCY, MASSACHUSETTS.

COIN-RELEASED ACTUATING MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 524,921, dated August 21, 1894.

Application filed January 6, 1894. Serial No. 495,944. (No model.)

To all whom it may concern:

Be it known that I, GEORGE T. WALDRON, of Quincy, in the county of Norfolk, State of Massachusetts, have invented certain new and useful Improvements in Coin-Released Actuating Mechanisms for Phonographs, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation of a phonograph showing my improved actuating mechanism, the case being represented as broken away; Fig. 2 a front elevation showing the position assumed by the parts in returning the spectacle; and Fig. 3 an enlarged vertical transverse section.

Like letters and figures of reference indicate corresponding parts in the different figures of the drawings.

My invention relates to a coin-released mechanism for actuating a phonograph; and it consists in certain novel features hereinafter fully set forth and claimed, the object being to produce a simple, cheap and effective device of this character.

The nature and operation of the improvement will be readily understood by all conversant with such matters from the following explanation:

In the drawings, A represents the case which may be of any suitable form or construction, B the drum or cylinder, C the spectacle to which the flexible receiving tube, D, is attached in the usual manner.

The main parts of the phonograph and its operative mechanism are of the ordinary form. An electric-motor, E, is driven by a current from the battery, F, and the shaft, *f*, of the drum is rotated by the usual intervening mechanism, which as it is of well known construction it is not deemed essential to herein specifically describe.

The spectacle, C, is mounted on a pivoted arm, J, and is adjustable by a projection, H, on the arm, J. A bell-crank lever, *k*, is mounted on the pivot of the projection, H, its short arm engaging a horizontal plate, *m*, on the supporting frame of the drum. In two

standards, *p*, forming part of said frame a longitudinally sliding horizontally arranged rod, *q*, is mounted. On said sliding-rod stops, *r*, *r*², are adjustably secured and held by set-screws, *t*. From one end of the rod outside the inner standard, *p*, a bearing, *v*, is pendent and in said bearing in the standard a winding stub-shaft, *w*, is mounted to rotate and slide. On the standard a pulley, *x*, is journaled and a cord, *y*, passing over said pulley is fast to a collar, *z*, on the shaft, *w*. One member of a clutch, 15, is mounted on the outer end of said shaft, the companion member being formed by the hub, 16 of a pulley, 17, loose on said shaft. The pulley, 17, is belted to the drive-pulley of the drum shaft, *f*.

A finger, K, is pivoted at, 20, in the frame to swing vertically. A coiled-spring, 21, around the pivot of said finger acts torsionally to throw it from left to right as viewed in Figs. 1 and 2 its normal position being that shown in Fig. 1. The cord, *y*, is secured to the upper end of said finger and passes through an opening, 22, in the pivot support, N, of the levers, H, *k*, the end of said cord being secured at, 26, to the long arm of the lever, *k*. There is an adjustable stop-screw, 30, in the support, N, for the lever, H, to limit the fall of said lever.

The ordinary coin-chute, P, opens through the top of the case in front of the phonograph mechanism in the usual manner, its lower end registering with the slot in the cash box, 35, in the body of the case.

A spring contact, 36, (see Fig. 1) is connected by a wire, 37, with one pole of the battery, F, the opposite pole of said battery being connected by a wire, 38, with one of the motor-brushes. A wire, 39, connects the opposite brush with a contact-point, 40, in the path of the free end of the spring-contact, 36. Between plates, 41, a block, 42, is fitted to slide, said block being fast to the free end of the spring-arm, 36, and having a beveled inner edge, 43, which will project into the path of a coin, 44, from the chute, P. In alignment with the block, 42, a plate or block, 45, is fitted to slide and is pivoted at, 50. Two levers, 55, and, 56, are fast on the same pivot 90 in the case. A link, 57, pivotally connects the plate, 45, with the lever, 56. A link, 54, diagonally arranged connects the

arm, 55, with a sliding rod, 51, fitted to move vertically through the case top and having an angle-arm, 52, at its upper end projecting into the path of the short arm of the spectacle lever, H. The vertical movement of the rod is adjusted by means of a thumb-screw, 53, a collar, 60, on said rod limiting its downward movement. By adjusting the connection, 61, of the link, 54, with the rod, 51, the movement of the plate, 45, inward across the mouth of the chute may be regulated.

The parts are arranged so that when a coin passes into the chute, P, it will engage the adjacent ends of the blocks, 42, and, 45, forcing the block, 42, outward and driving the spring-contact, 36, into engagement with the contact, 40, closing the circuit of the battery and charging the motor. When the rod, 51, is drawn upward the block, 45, will be drawn out releasing a coin, 44, which will fall into the box, 35, and the spring-arm, 36, will drive the block, 42, inward and break the circuit.

The parts being in the position shown in Fig. 1 and the circuit closed by the coin, the ordinary phonograph mechanism is in action driving the worm shaft and drum or mandrel in the usual manner, the spectacle traveling from left to right, as viewed in said figure. When the support end engages the stop, r^2 , the rod, q , is thrown from left to right drawing with it the shaft, w , and engaging the clutch member, 15, fast on said shaft with its companion member, 16, on the hub of the pulley, 17, which is continuously rotated as above described. This causes the shaft, w , to rotate and winds the cord, y , on the drum or sleeve, z , of said shaft drawing the finger, K, from right to left against the tension of its spring, 21, as shown in Fig. 2. The cord being connected to the lever, k , by the screw, 26, carries the support, N, with it and moves the spectacle from right to left until said support engages the stop, r , by which the rod, q , will be carried in like direction moving the shaft, w , and engage the clutch-members, 15 and 16. This frees the pulley, 17, which runs loose and the coin having been released by the contact of the spectacle lever, H, with the arm, 52, of the rod, 51, whereby said rod was elevated and the plate,

45, withdrawn breaking the circuit the parts stop with the spectacle in position to operate again on the phonograph cylinder when another coin shall be dropped into the chute. Nor do I confine myself to the particular device shown for returning the spectacle as any means operated by the drive mechanism of a phonograph and tripped positively by the spectacle at the end of its movement in one direction may be employed. The arrangement of the coin-releasing mechanism may also be varied without departing from the spirit of my invention.

Having thus explained my invention, what I claim is—

1. The combination of the spring-tensioned finger, the rotary stub-shaft and a cord connecting the shaft and finger with the phonograph spectacle; a loose pulley on the shaft driven by the phonograph-actuating mechanism and mechanism operated positively by the spectacle for locking said pulley.

2. The spectacle and its driving mechanism in combination with the sliding-shaft, w ; loose pulley thereon and clutch mechanism the sliding rod, q , for moving said shaft longitudinally; the spring arm, K, and a cord connecting said arm with the shaft and spectacle and projections on the rod in the path of the spectacle.

3. In a phonograph in combination with the coin-chute two laterally sliding-plates projecting into the path of the coin, one of said plates being arranged to close the circuit of the phonograph motor when engaged by a coin, and mechanism connecting with the companion plate and operated by the phonograph-spectacle whereby the coin may be released from said plates.

4. In a phonograph, the combination with the adjustable sliding-rod, 51, disposed in the path of the phonograph-spectacle, of a coin-chute, a sliding-plate disposed in the path of the coin; levers connecting plate and rod whereby the plate may be withdrawn as the rod is elevated substantially as described.

GEORGE T. WALDRON.

Witnesses:

K. DURFEE,
O. M. SHAW.

(No Model.)

T. H. MACDONALD.
GRAPHOPHONE.

No. 527,755.

Patented Oct. 16, 1894.

FIG. 1.

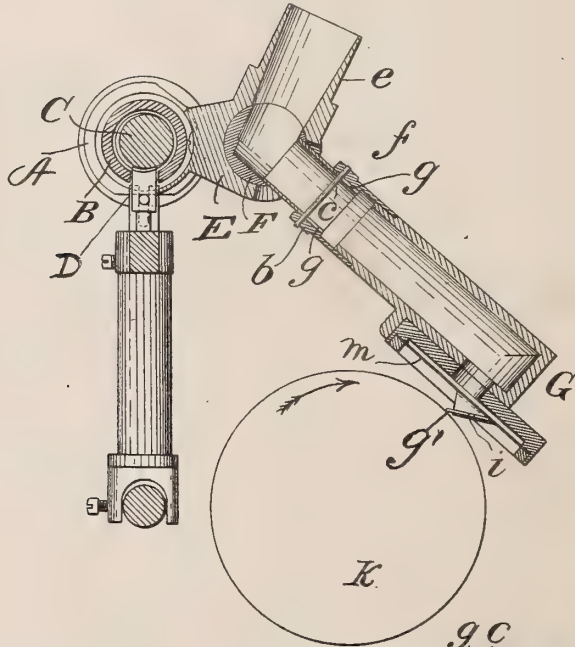


FIG. 2.

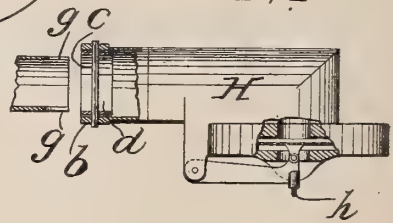


FIG. 4.



FIG. 6.



FIG. 5.

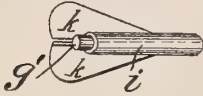
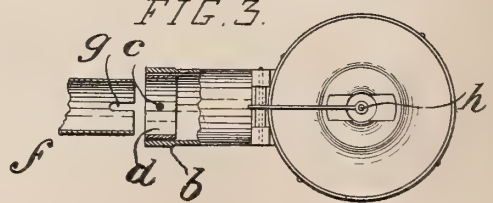


FIG. 3.



Witnesses.
W. R. Edglen.
G. W. Lewis.

Inventor.
Thos. H. Macdonald
by J. L. Macdonald
his attorney

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 527,755, dated October 16, 1894.

Application filed June 22, 1894. Serial No. 515,408. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Graphophones, which is fully set forth in the following specification.

The present invention has reference to the construction of the sound-recording and reproducing parts of instruments known as graphophones or phonographs, and its chief object is to produce a recorder and reproducer which require no adjustment, and which in other respects fulfill the conditions requisite to good practical results.

The chief difficulty heretofore encountered in the use of graphophones has been due to the fact that the recorder and reproducer (particularly the former) required very nice and accurate adjustment, beyond the skill or patience of ordinary users.

Heretofore, the recorder when left free to find its working position by gravity, has had a bridge extending over and in front of the diaphragm, which bridge rested directly upon the tablet. The recording stylus attached to the diaphragm projected a certain distance beyond the bridge, this distance determining the depth of cut and requiring to be regulated with great nicety. When the proper adjustment is slightly disturbed (which frequently happens) imperfect records are made, and trials for readjustment become necessary. Many efforts have been made to overcome this difficulty, but heretofore without success.

In another common type of apparatus the frame of the recorder rests upon a fixed rail which supports its weight and determines its position. The stylus is carried by a weighted lever being pivotally connected thereto. This construction is very delicate and complicated.

By the present invention the adjustment of the recorder is rendered entirely automatic, its construction greatly simplified, and all levers, bridges, and springs are dispensed with.

The recording device as a whole comprises a tubular stem detachably secured to a tubular arm pivoted to swing vertically, a recording point which is fixed directly to the diaphragm and rests upon the tablet without the intervention of any lever, spring or bridge between the tablet and recorder-frame. In other words, the recorder is freely suspended so

that its entire weight comes on the recording point, and since the latter is directly fixed to the diaphragm without any intermediate yielding parts the movements of the diaphragm are faithfully recorded, the results in this respect being superior to those heretofore obtained. The swinging stem or arm to which the recorder is attached is pivoted above the axis of the tablet, and the recorder being entirely free bears at its point upon the side of the tablet, the weight of the recorder and the angle at which it is placed determining a proper depth of cut.

The reproducer is in shape and general construction similar to the recorder, having a tubular stem adapted to be detachably connected to the same tubular arm to which the recorder when in use is attached. The stem of the reproducer, however, has a swivel or joint permitting a slight oscillation with minimum friction in a line transverse to the record-grooves of the tablet, this swivel-joint being its most important feature of construction. Heretofore the hollow arm of the reproducer has always been rigid in the direction of its travel, and the stylus has been made of flexible material, or jointed so as to enable it to find and keep the bottom of the record. Such reproducers do not, however, track the record perfectly. When, by reason of slight variance between the spirals of the feed screw and those of the record, the stylus presses on one side or the other of the groove it tends to ride up out of contact with the bottom thereof, and the greater the variance the greater is this tendency.

The difficulty is completely overcome by putting a swivel joint in the stem of the reproducer as above described. In such case the reproducer can oscillate as a whole, and its weight always keeps the point in contact with the record at the bottom of the groove, no adjustment of any sort being required.

This improvement, while important for all classes of machines, is specially valuable for automatic or coin-controlled graphophones.

The invention includes means whereby the connection and disconnection of the recorder and reproducer can be very quickly effected.

The invention will be fully understood from the following description taken in connection with the accompanying drawings,

which form part of this specification, and in which—

Figure 1 is a section transverse of the feed screw, showing the carriage for the recorder and reproducer, the former instrument being in place. Fig. 2, is a side view of the reproducer, partly in section; and Fig. 3 a bottom view thereof partly in section. Figs. 4, 5, and 6 are details illustrating the mounting of the recording stylus.

The carriage A, which serves for both recorder and reproducer, slides upon sleeve B, which surrounds the feed screw C, the sleeve being provided on its under side with a long slot to permit nut D to engage with the feed screw.

On carriage A is a coupling-piece E having a thimble *e* to which the bearing or speaking tubes are connected, and in this coupling piece is swiveled a socket F having a short tubular arm *f* which projects through a slot in piece E and can oscillate on a horizontal axis to the limits of this slot. Arm *f* has in its end two slots or notches *g* diametrically opposite each other. Arm *f* is the connecting piece for both the recorder G and reproducer H. Each of these devices has a tubular stem *b* just large enough to fit closely over arm *f*, and a catch pin *c*, which takes into the notches *g* of said arm and prevents turning of the instrument on the arm. The reproducer H has in the end of its stem a sleeve *d* which fits loosely therein and is swiveled by means of the catch-pin *c*, the latter being at right angles to the axis of socket F. Thus the reproducer has freedom of oscillation with slight friction transversely to the lines on the recording tablet K. Its stylus *h* may be practically rigid.

The recorder G when in use rests with its entire weight on the tablet K, but the pressure of its weight, instead of being taken by a bridge or rest as heretofore, comes entirely upon the point *g'* of the stylus. The axis of the socket F, by which the recorder is freely suspended, is above the axis of the tablet, and the recorder when in use is inclined at a small angle from a vertical line, its point bearing against the side of the tablet. The direction of rotation of the latter is indicated by the arrow, Fig. 1, and the motion of the tablet tends to throw the recorder outward. The weight and the angle of inclination of the latter counteract this tendency to the extent of producing always a proper depth of cut, irrespective of inequalities in the surface of the cylinder.

The point *g'* of the stylus is in the form of a pencil and is held by a clamp *i* stamped out of sheet metal. It is bent to form a socket (which receives the pencil and holds it obliquely to the diaphragm) and two wings or flanges *k* which are cemented, soldered or otherwise affixed directly to the diaphragm *m*. Thus there are no yielding parts between the point and the diaphragm.

It will be seen that the form of instrument

is simple and easy of construction, and very strong, having nothing about its construction which is likely to become deranged in ordinary handling and usage. Its chief merit, however, is that the instrument as a whole, comprising a stylus directly fastened to and supported wholly by the diaphragm, and a freely suspended arm, and making contact with the record only at the point of the stylus, constitutes a self-adjusting recorder, requiring no attention from the user, and produces an accurate and in every way satisfactory record.

Having thus described my invention, what I claim is—

1. In a graphophone, the combination with the sliding carriage, of a socket-piece swiveled therein on a horizontal axis and having a tubular arm, and a recorder and reproducer provided each with a tubular stem fitting said arm and adapted for detachable connection therewith, substantially as described.

2. The combination with the sliding carriage, of a socket-piece swiveled therein on a horizontal axis and having a tubular arm slotted or notched in its end, and a recorder and reproducer having each a tubular stem fitting said arm, and a catch-pin for engaging said slot or notch and centering the instrument, substantially as described.

3. The combination with the sliding carriage, of a socket-piece swiveled therein and having a tubular arm notched in the end, a reproducer having a tubular stem, a sleeve swiveled in the end of said stem and adapted to fit tightly over said arm, and a pin by means of which said sleeve is swiveled, said pin engaging the notch in said arm when the reproducer is in place, substantially as described.

4. A reproducer for graphophones having a freely suspended supporting stem, said stem containing a swivel joint permitting oscillation of the reproducer transversely to the lines of the record, substantially as described.

5. A self-adjusting recorder for graphophones comprising a freely suspended arm, a diaphragm, and a point or stylus attached rigidly to and carried wholly by said diaphragm, said recorder resting freely against the recording tablet and making contact therewith only at the point of the stylus, substantially as described.

6. A recorder for graphophones comprising a diaphragm, a recording stylus in the form of a pencil, a clamp of sheet metal bent to form a socket in which the pencil is held and two wings or flanges by which it is fixed to the diaphragm, the pencil being oblique to the latter, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

WM. R. MILLER,
M. SPEER.

H. J. LIORET.
PHONOGRAPH.

No. 528,273.

Patented Oct. 30, 1894.

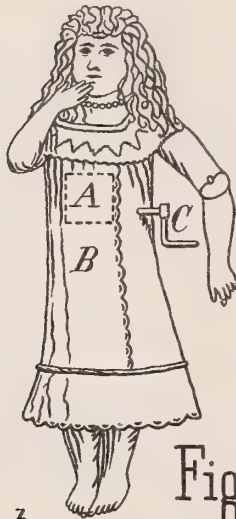


Fig. 1

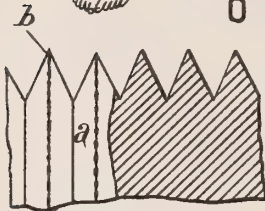


Fig. 4



Fig. 5

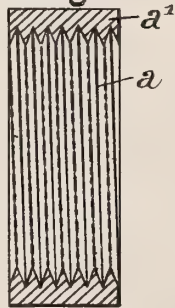


Fig. 6

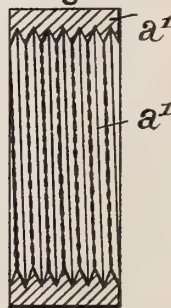


Fig. 7

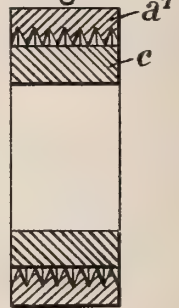


Fig. 8

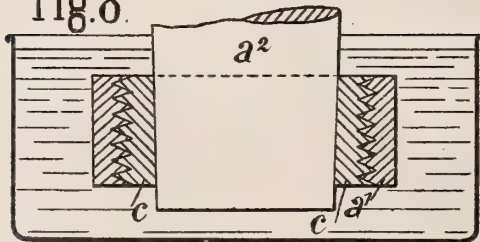


Fig. 9

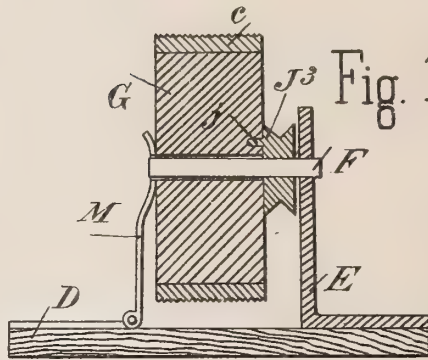


Fig. 10

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by attorneys
Frount & Ward

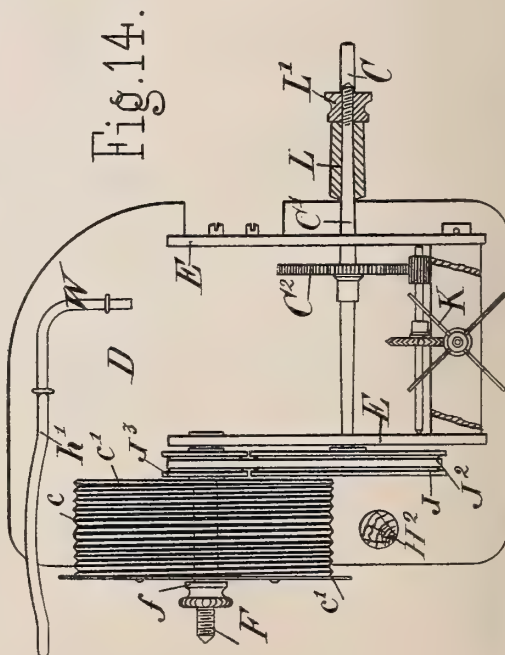
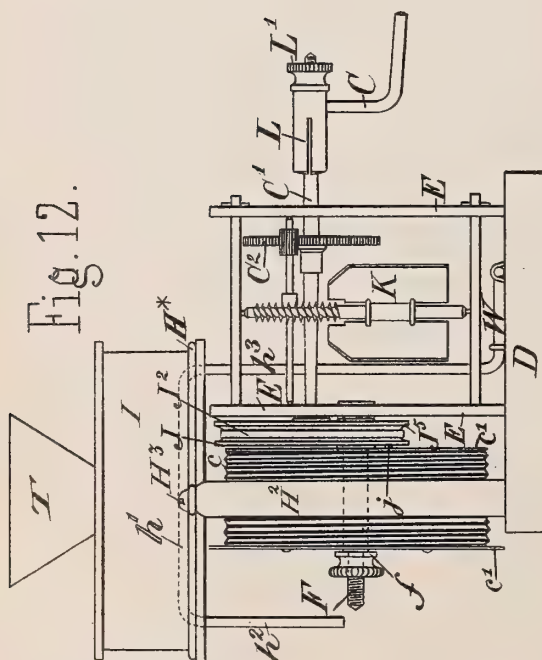
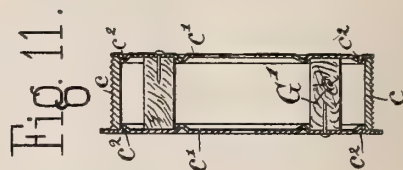
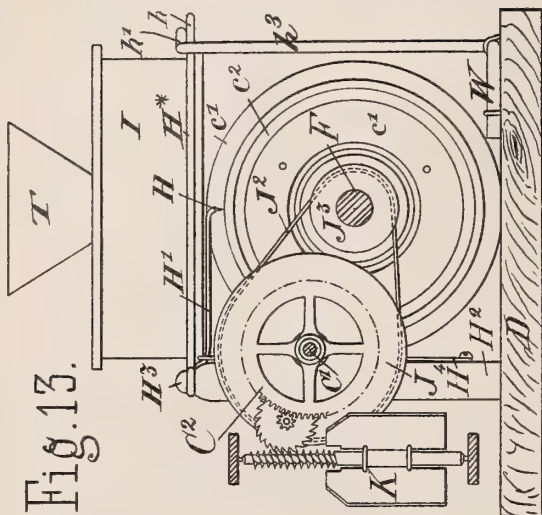
(No Model.)

4 Sheets—Sheet 2.

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PHONOGRAPH.

No. 528,273.

Patented Oct. 30, 1894.



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PHONOGRAPH.

No. 528,273.

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Fig. 15.

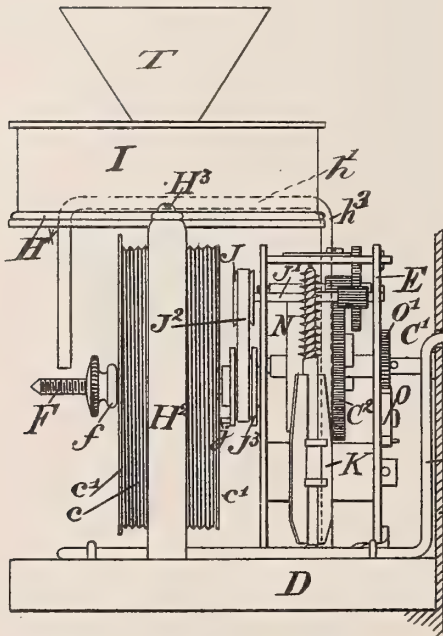


Fig. 16.

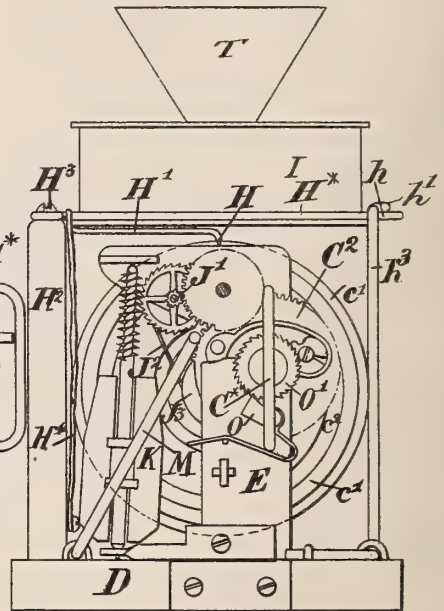
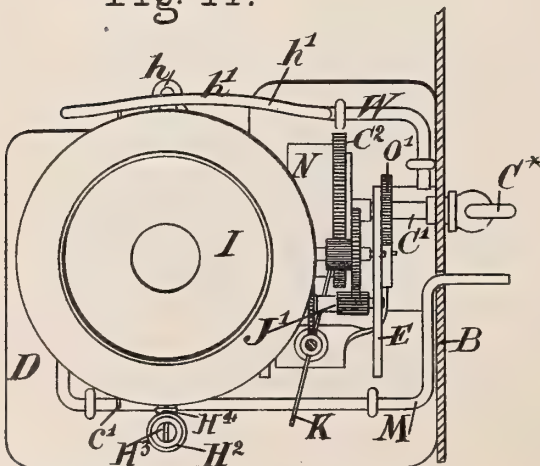


Fig. 17.



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PHONOGRAPH.

No. 528,273.

Patented Oct. 30, 1894.

Fig. 18.

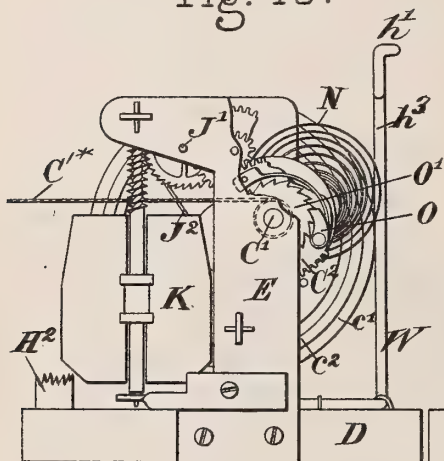


Fig. 19.

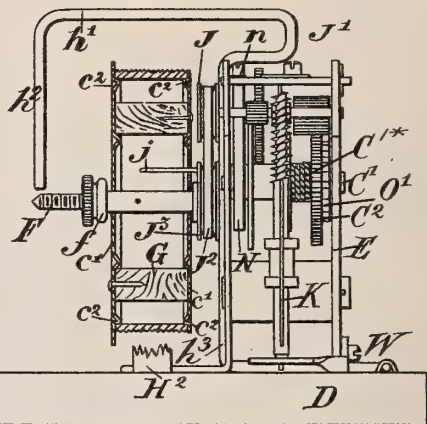
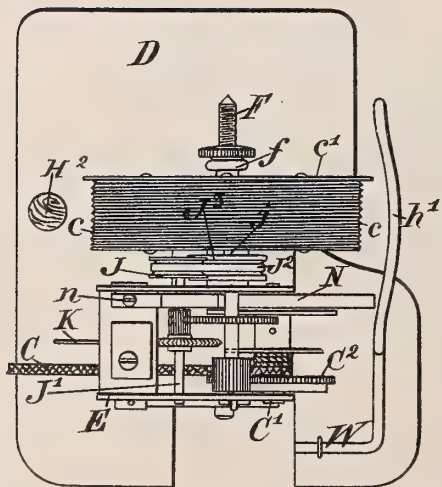


Fig. 20.



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UNITED STATES PATENT OFFICE.

HENRI JULES LIORET, OF PARIS, FRANCE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 528,273, dated October 30, 1894.

Application filed December 20, 1893. Serial No. 494,179. (No model.) Patented in France May 18, 1893, No. 230,177.

To all whom it may concern:

Be it known that I, HENRI JULES LIORET, of Paris, in the Republic of France, have invented a new and useful Improvement in
5 Phonographs, (for which I have obtained a brevet d'invention of the Republic of France, No. 230,177, dated May 18, 1893,) of which the following is a specification.

The object of my invention is to construct
10 phonographs at a low price and consequently to provide for their application to very numerous purposes, such for instance, as the manufacture of new toys.

My invention relates in the first place to
15 the construction of the cylinder or roller intended to receive the impressions of the recording style which is carried by the vibrating plate, diaphragm or membrane which is spoken against, whereby the said cylinder,
20 when engraved or impressed, may be used as a matrix to reproduce a great number of times the same impressions upon other cylinders which I call reproduction cylinders.

The improvement also relates to the mode
25 of mounting or setting up these reproduction cylinders; also to the arrangement of the receiving style and of the resonant box or resonator to which the said style is adapted; and further to the motor mechanism of the phonographic apparatus.

In the accompanying drawings Figure 1 is a profile view of part of a matrix cylinder. Fig. 2 is a similar view showing the mode of guiding the style upon the fillets of the matrix cylinder. Fig. 3 is a similar view of part
35 of the matrix cylinder and of the reproduction cylinder which may be obtained from it. Figs. 4 to 8 represent successive stages of the manufacture of a reproduction cylinder of celluloid and will be hereinafter more particularly described. Fig. 9 represents a doll
40 furnished with my apparatus. Fig. 10 is a sectional view representing one way of mounting the cylinders of my system. Fig. 11 is a similar view showing another mode of mounting my cylinders. Figs. 12 and 13 represent
45 elevations at right angles to each other, Fig. 13 being partly in section, of one example of a complete apparatus embodying my invention. Fig. 14 is a plan view partly in section,
50 corresponding with Figs. 12 and 13. Figs. 15 and 16 represent elevations at right angles to

each other, Fig. 16 being partly in section, of a second example. Fig. 17 is a plan view corresponding with Figs. 15 and 16. Figs. 18 and
55 19 represent elevations at right angles to each other, Fig. 19 being partly in section, of a third example. Fig. 20 is a plan view corresponding with Figs. 18 and 19.

Similar letters of reference designate corresponding parts in all the figures.

The matrix cylinders are obtained in the following manner: I take a sleeve or hollow cylinder of soft steel having on its outer circumference a thread with triangular cross-
65 section of suitable fineness and place it in front of the recording style attached to the vibrating plate or diaphragm which is spoken against, so arranging the said sleeve and style that the point of the style engraves its
70 impressions successively along the top angle of the thread; this being where the resistance to penetrate is the least, first because of the slight thickness of metal presented and second, by reason of the absence of lateral con-
75 tact or friction due to contiguous surfaces because such surfaces do not exist in the neighborhood of the top angle of the thread; where the style may act with more efficacy and cut in a suitable manner in the sharp
80 edge the impressions which are to be left upon the cylinder.

To receive the impression of the sonorous vibrations the threaded sleeve or cylinder is keyed upon an arbor which is terminated by
85 a screw of the same pitch engaged in a nut. In front of the cylinder or sleeve thus mounted I arrange any appropriate phonographic recording apparatus—for example a vibrating
90 membrane furnished with a style, taking care that the style bears upon the angle of the thread of the cylinder. If then the arbor is set in motion, the cylinder turns in front of the style and if one speaks against the membrane the style will engrave along the angle
95 of the thread impressions of form and depth corresponding with the nature of the sonorous vibration. The cylinder being thus engraved I temper it and thus obtain a cylinder which may be employed to produce the
100 vibration of the membrane of the receiver and reproduce sounds which have been made in front of it.

The first part of my invention is indicated

in Fig. 1 which represents an elevation and section of portions of the threaded cylinder showing the impressions *b* cut in the angle of its thread by the recording style.

5 When the matrix cylinder *a* is employed directly to make the receiver speak, the receiving style *d*, of which the blunt point should rest upon the angle of the thread as shown toward the left of Fig. 2, bears upon
10 an additional lateral point *d'*, which is engaged in the groove of the thread in such manner as to be guided by it and to produce naturally the advance both of itself and of the receiving style without which there would
15 be necessary for the latter a screw or other mechanism of some kind or other corresponding with the thread of the cylinder. There might also be employed a style with a point broadened and hollow in the form of a crescent in such manner as to embrace the angle
20 of the thread and yet only rest upon it by a point as shown toward the right hand of Fig. 2. It has been mentioned how the cylinder engraved upon the angles of its thread and
25 then tempered may be employed directly to produce the speech of the receiver; its great hardness assuring it the advantage, quite new, of great durability; but it may also, as I have said, serve as a matrix or as a rowel
30 utilizable to produce directly a great number of times and consequently in a very economical way upon other cylinders of soft metal or other suitable material, impressions which will enable them to be used to put in
35 vibration the membrane of the receiver. These are the new cylinders which I have designated under the name of reproduction cylinders.

When it is desired to obtain a cylinder of
40 soft metal or other analogous material it may be done directly by simply causing the matrix to roll under a suitable pressure upon a cylinder of the same diameter in such manner as shown in Fig. 3, or else upon a ribbon
45 of suitable profile which may be afterward enrolled upon a roller. The reproduction cylinder has preferably a thread of the same pitch as that of the matrix cylinder in order that the impressions engraved upon the angle
50 or top of the thread of the latter may be reproduced in the bottom of the thread of the reproduction cylinder as shown in Fig. 3. The ribbon may also present striations or grooves which, when it is enrolled upon its roller,
55 will constitute a threading. In this case the impressions are also reproduced at the bottom of these striations or grooves. In fact these impressions will be counterparts of those of the matrix cylinder, but that is without importance from the point of view of the
60 reproduction of the sounds.

It is hardly necessary to remark that when use is made in the receiver of the reproduction cylinder *c* like that which has just been
65 described, the receiver style may be guided very simply by making its point bear on the bottom of the cavity of the thread.

It may be remarked (see Fig. 3) that the threading of the reproduction cylinder *c* is not so deep as that of the matrix cylinder *a* 70 in order to facilitate the reproduction. This threading only needs to be deep enough for the guidance of the style.

When the reproduction cylinders are not required to be so durable, instead of making 75 them of soft metal or other analogous matter, they may be made of celluloid. This material presents the advantage of well preserving the impressions, not being liable to break and above all not being sensibly influenced 80 by atmospheric variations. Moreover, besides being homogeneous and very hard, they cut and mold sharply and they wear well.

To produce the cylinders of celluloid, I operate as follows: I prepare the matrix cylinder *a* (Fig. 4) as I have hereinbefore described. Then I take upon it as is shown in
85 Fig. 5, a galvano-plastic mold *a'* which presents consequently the form of a tube having in its internal surface the counterpart of the threading and the impressions of the
90 matrix cylinder *a*. (See Fig. 6.) I remove this tube from the matrix cylinder by first heating it externally to expand it sufficiently to enable it to be unscrewed from the said
95 cylinder, the impression being so slight that very little expansion is necessary. After its removal I introduce into the said tube a sleeve or ring *c* of celluloid (see Fig. 7) just
100 large enough to enter it freely, then plunge the whole into hot water. The celluloid is thus softened, and I then introduce forcibly into the said collar or ring *c* a mandrel *a''* sufficiently large to dilate the said ring or collar
105 and cause it to penetrate into all the cavities of the mold *a'* as shown in Fig. 8. I then plunge the whole into cold water and the celluloid recovers its hardness and is at the same time generally contracted sufficiently to permit the easy withdrawal of the ring *c*
110 from the mold *a'* by unscrewing it therefrom. If, however, the contraction of the ring *c* in this way is not sufficiently greater than that of the mold *a'*, the mold may be slightly warmed by heat externally applied. 115

It may be here mentioned that the impression produced by the style on the matrix cylinder and reproduced in reverse in the mold *a'* is so slight that only a very slight dilation of the ring *c* is necessary to obtain the im- 120 pression on it and a very slight contraction to permit it to be unscrewed from the mold *a'* without damaging said impression.

It may be further mentioned that the threads of the matrix are very fine in practice and are very much exaggerated in the drawings to facilitate the illustration. This ring *c* thus becomes finally a reproduction cylinder which is an exact reconstitution of the matrix cylinder *a*. This method is 130 rapid and economical and gives perfect results. It may be understood moreover that according as the impressions have been engraved upon the angle or in the bottom of

the thread of the matrix *a*, the cylinder *c* will also have the impressions upon the angle or in the bottom of its thread and that the receiver style should be formed to correspond.

In the following description of examples of my invention I will suppose the phonograph arranged in the body of a doll as shown in Fig. 9, but it will be understood that it is capable of any other application.

For whatever purpose they are to be applied the cylinders *c* obtained by either of the means which I have just described may be fastened upon a cylindrical drum *G*, made of wood for example, which is fitted to turn freely upon a fixed arbor *F*. This arbor is carried by a standard *E* fixed upon a base *D* as shown in Fig. 10. It also receives a loose pulley *J*³ carrying a pin *j* which enters into a hole in the drum *G* in such manner as to drive the cylinder *c*. A hinged spring arm *M* serves to hold the drum *G* and cylinder *c* in place upon the arbor but permits their removal therefrom. When the cylinder *c* is of celluloid I prefer to mount it in another way as is shown in Fig. 11, that is to say, to place it between two thin disks *c'* forming jaws and having annular centering projections *c*² on their inner faces. These two disks are maintained at a suitable distance apart by a wooden ring *G'* to which they are nailed. The cylinder *c* thus mounted is placed upon the arbor *F*, the disks *c'* having central holes which fit the said arbor.

As to the mechanism for driving the cylinder *c*, it may be varied in many ways, but it is characterized in all cases by the fact that the motive power is not applied directly to the arbor *F* of the said cylinder *c*, but to a driving spindle *C'* (see Figs. 12 to 20) between which and the said cylinder there is an elastic or yielding power-transmitting device. In the example represented this power-transmitting device consists of an india rubber driving belt *J*² running on a driving pulley *J* on the spindle *C'* and on the pulley *J*³ hereinbefore mentioned. The principal advantage of this method of driving is that the elastic belt may allow the driving pulley *J* to slip a certain distance without letting it go altogether when the cylinder *c*, which has a considerable relative weight, acts as a fly-wheel to remedy any inevitable inequalities in the speed of the driving spindle *C'*, especially if it is moved by hand.

In my apparatus the blunt pointed receiver style *H* is affixed to or formed by the extremity of a horizontal arm *H'* which carries a cylindrical resonance box or resonator *I* of any suitable material, the style being rigidly fixed under the center of this resonator. The said arm *H'* is mounted freely upon a pivot *H*³ carried by a column *H*² in such manner that while free to turn on this pivot the ensemble formed by the resonator and the style rests freely upon the cylinder by its own weight and may follow a generatrix of the cylinder in the

threading of which the style is always guided as has been previously described. For greater simplicity, the style, the arm which carries it, and the support for the box may be constituted as shown in the drawings, by one and the same metal wire, preferably of steel, which surrounds the base of the resonator, as shown at *H*^{*}, forms an eye around the pivot *H*³ and passes under the base of the resonator to form the arm *H'* the extremity of which is bent down and pointed in such manner as to constitute the style *H*.

As to the column *H*², it is simply placed tightly in a hole in the base *D*. In order to insure a better contact between the style and the cylinder, the metal wire which carries the resonator and which forms the style is constantly pulled downward by a spring of any suitable kind as an elastic band *H*⁴, of which one of the ends is attached to a fixed point. Moreover, the metal wire has formed in it a loop *h* which projects from the resonator and constitutes a guiding arm and which, being guided under a suitably arranged guide *h'*, prevents the resonator *I* and the style *H* from being accidentally separated from the cylinder beyond a certain distance, when the apparatus receives a shock for example. The said guide *h'* is represented as formed by the horizontal upper portion of a fixed yoke *W* made of strong wire and fastened to the base *D*, which yoke has also two vertical branches *h*² and *h*³. When the resonator in turning about the pivot *H*³ arrives at the end of its course in one direction or the other, that is to say, when the style has run the entire length of the cylinder, its guiding arm *h* encounters one of the vertical branches *h*² *h*³ of the yoke and prevents the resonator and the style from running any farther. On the other hand, when the apparatus is reversed, the guiding arm *h* coming against the guide *h'* prevents the resonator from being too far separated from the cylinder. Were it not for this guide all the weight of the resonator would be thrown back upon the loop which forms the eye around the pivot *H*³ at the bending of said loop, thereby disarranging the said apparatus.

The resonator has preferably an opening in its top to receive the end of a trumpet *T* which facilitates the proper propagation of the sound.

When the cylinder is turned in the proper direction to make the apparatus speak, the style follows freely the thread of the cylinder *c* and when it has arrived at the extremity of the cylinder all that has to be done is to shift it to the other end to make the apparatus repeat its speech.

The phonographic apparatus thus set up may be driven by hand or else by the aid of a clock mechanism. In the apparatus represented in Figs. 12 to 14, the movement is produced by the turning of a hand-crank *C*. This crank, instead of being keyed upon the spindle *C'*, is carried by a split socket *L*

mounted upon a slightly conical portion of the spindle C'. A nut L' screwed on to the end of the said spindle serves to regulate the tightness and the adhesion between the socket and the spindle.

The spindle C' has geared with it and drives a fly regulator K. The resistance presented by the air to the movement of this fly increases with the speed of the latter, but there is one speed of rotation of the crank C and spindle C' at which this resistance is equal to the adhesive force of the socket L on the spindle C'. If this limitation of speed is passed the resistance opposed to the driving mechanism by the fly K becomes superior to the force of adhesion of the socket L and the latter slides upon the spindle C' which preserves always a constant speed limited to the desired degree.

In the example represented in Figs. 15 to 17 the drum G and cylinder c are driven by a spring clock mechanism which is wound by means of a key C*. In this example the fly regulator K is applied as in the example previously described.

I employ very simple means of starting and stopping the clock movement. This means consists of a movable stop M mounted upon the base D in such manner as to be capable of sliding forward and backward when manipulated by means of a prolongation m suitably guided. When, after the winding, this stop M has been brought to the position indicated in the drawings, the clock movement is permitted to operate because the fly K is allowed to turn freely without encountering the said stop; but on the other hand, the winding is impossible because the key in turning would be arrested by the prolongation m of the stop. If on the contrary, the latter is pushed inward the winding becomes possible but the movement is stopped because the fly in turning would encounter the stop and be thereby stopped.

In the example represented in Figs. 18 to 20 the mechanism is simplified by substituting for the clock movement a simple spring N of which one of the extremities is attached to the fixed pin n and the other is attached to the motor spindle C'. To produce the winding, all that it is necessary to do is to draw a small cord C'* which is enrolled upon a drum keyed upon the spindle C'. The spindle is thus made to turn in the desired direction to wind the spring N. During this movement the transmitting mechanism does not turn because the gear C² is loose upon the spindle C' and the pawl O which is carried by the said gear may slip over the teeth of the ratchet wheel O' keyed upon the said spindle; but when the cord C'* is let go, the spring tends to produce the turning of the spindle C' in a reverse direction. The ratchet wheel O' then drives the gear C² and consequently sets in movement all the transmitting mechanism.

The speed of this movement is also regulated by the fly K.

I have supposed in the example represented as I have hereinabove stated, that the phonographic apparatus was placed in the cavity A provided in the body B of a doll (Fig. 10). It is then arranged in such manner that one may from the exterior operate the crank C or wind the clock movement by means of the key C* or the cord C'*.

One or more of the walls of the cavity A should be very thin and also pierced with holes in order that there may be no obstacle to the propagation of the sound.

What I claim as my invention is—

1. In a phonograph, the combination with a spirally threaded cylinder, a style d having a point which runs on the top of the thread of the said cylinder and an additional guiding point d' engaging in the groove of said thread, substantially in the manner and for the purpose herein described.

2. In a phonograph, the combination with a threaded cylinder and a resonator turning about a fixed pivot and furnished with a style to follow the threading of the cylinder, of a guiding yoke comprising a horizontal portion and vertical branches, and a guiding arm carried by the resonator and engaging under the horizontal portion of said yoke, substantially as and for the purpose herein described.

3. The method of reproducing phonographic cylinders which consists in first obtaining a metal mold by electro-deposit upon an original phonographic cylinder, next placing bodily within the so obtained mold a solid ring of plastic material capable of being softened by heat, next softening this ring by heat, and finally so distending the said ring within said mold by internal pressure that it will receive therefrom an impression corresponding with that of the original cylinder, substantially as herein described.

4. The combination in a phonographic cylinder, of a hollow cylinder c, disks c' having centering projections for said hollow cylinder and a spacing ring G' arranged between said disks and means of securing said disks to said spacing ring, substantially as herein described.

5. The combination with a motor for operating a phonograph, of a driving crank on the main spindle of said motor, an adjustable friction device between said crank and spindle and a rotary fly geared with and driven by said motor, substantially as and for the purpose herein set forth.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HENRI JULES LIORET.

Witnesses:

MAURICE MERCIER,
CLYDE SHROPSHIRE.

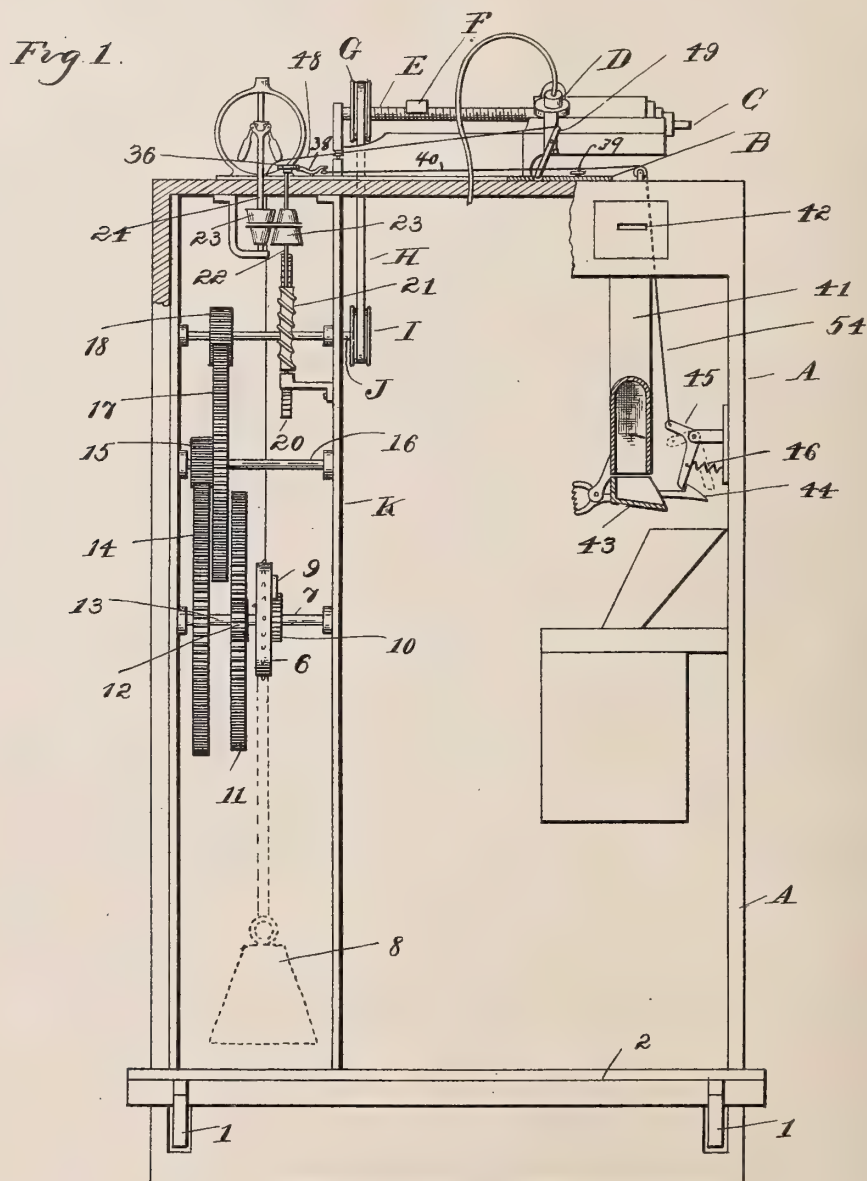
(No Model.)

3 Sheets—Sheet 1.

F. S. CHURCH.
COIN CONTROLLED PHONOGRAPH.

No. 529,019.

Patented Nov. 13, 1894.



Witnesses
A. L. Kobbie
N. L. Lindop

Inventor
Frank S. Church
By Wm. K. Sprague & Co.
Atty.

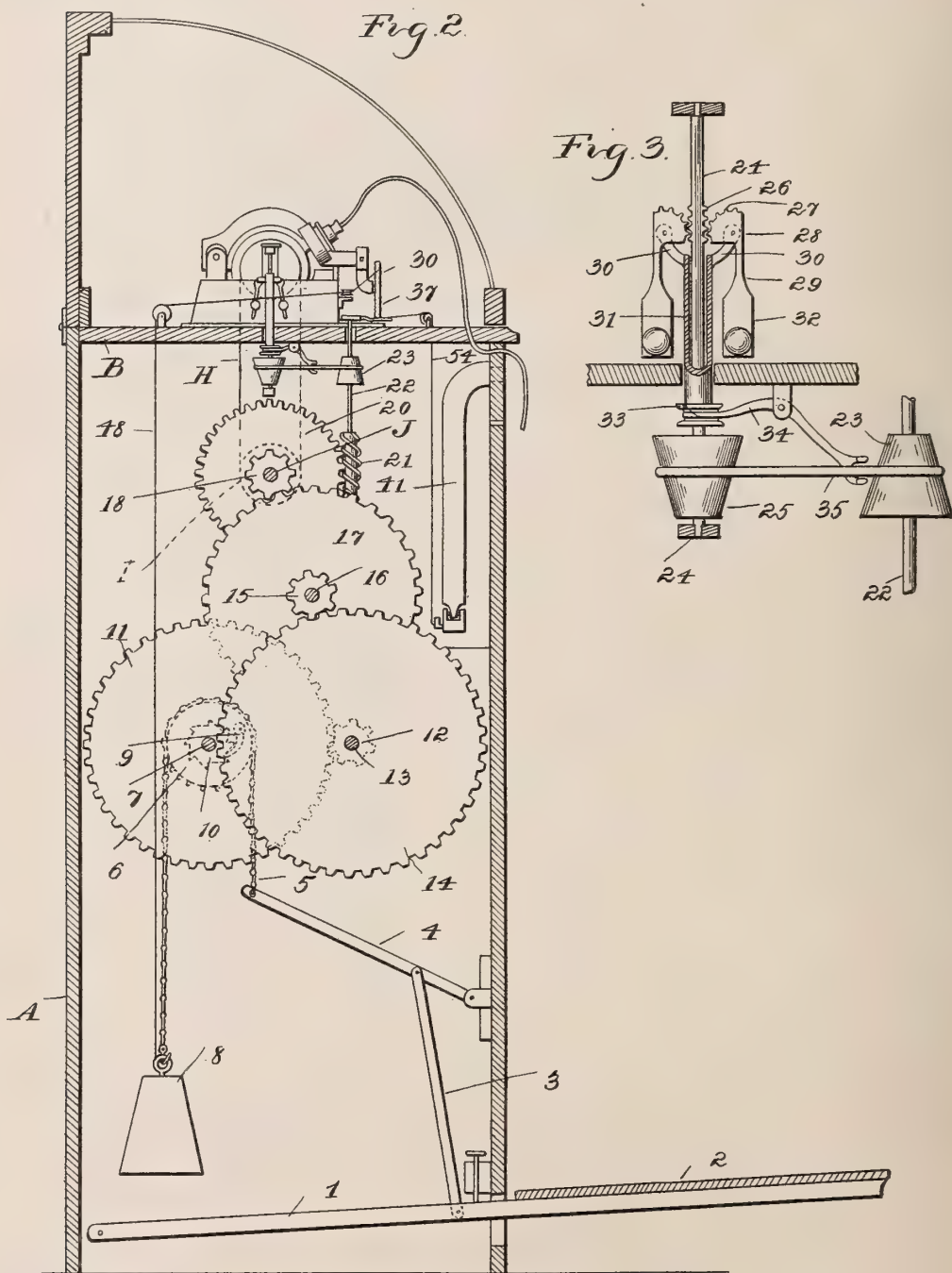
(No Model.)

3 Sheets—Sheet 2.

F. S. CHURCH.
COIN CONTROLLED PHONOGRAPH.

No. 529,019.

Patented Nov. 13, 1894.



Witnesses
A. L. Kobbler
N. L. Lindop

Inventor
Frank S. Church
By *Woodward & Lothrop* Attys.

3 Sheets—Sheet 3.

No. 529,019.

Patented Nov. 13, 1894.

Fig. 4.

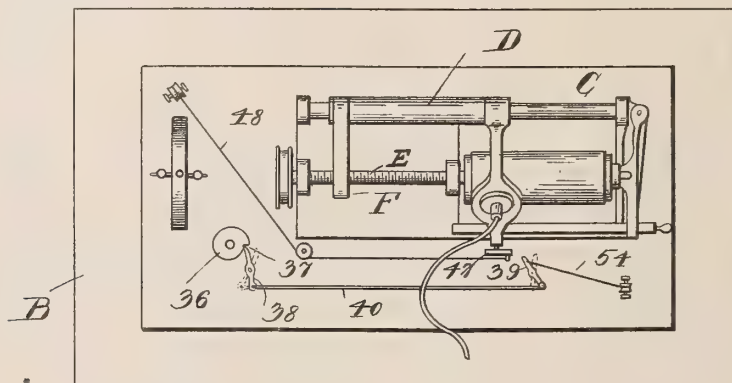
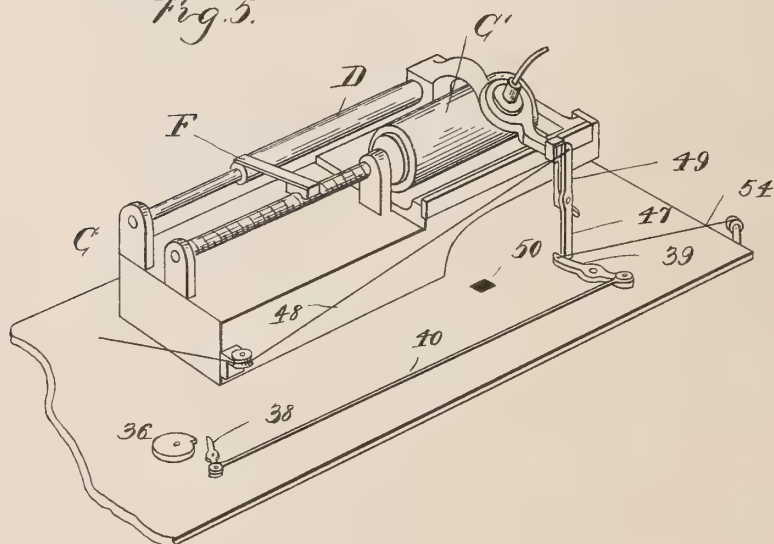


Fig. 5.



Witnesses
A. L. Habber

N. L. Lindop

Inventor
Frank S. Church

By Wm Sprague Esq
Atty's.

UNITED STATES PATENT OFFICE.

FRANK S. CHURCH, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-HALF TO
W. FITZ-HUGH EDWARDS, OF SAME PLACE.

COIN-CONTROLLED PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 529,019, dated November 13, 1894.

Application filed May 12, 1892. Serial No. 432,732. (No model.)

To all whom it may concern:

Be it known that I, FRANK S. CHURCH, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Coin-Controlled Phonographs, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to new and useful improvements in coin controlled phonographs, and the invention consists in the peculiar construction of a motor which I have shown applied to the operation of a phonograph and designed to be set in motion by the weight of the operator, the motion continuing for a determined length of time dependent upon the downward movement of the platform or lever, upon which the operator stands, and the lock applied at the end of said movements or thereabout whereby the device which is operated cannot be again started except through the intervention of some intermediate mechanism.

In the herein application I have shown the retraction of my device controlled by a coin operated mechanism.

The invention further consists in the peculiar construction, arrangement and combination of the various parts, all as more fully hereinafter described.

In the drawings, Figure 1 is a front elevation of a phonograph cabinet showing the phonograph with my motor applied, the front casing of the cabinet being removed. Fig. 2 is an end elevation thereof, with the end of the casing removed. Fig. 3 is a detail section through the governor. Fig. 4 is a plan view showing the phonograph and the means of applying the lock. Fig. 5 is a perspective view of the parts shown in Fig. 4, in a different position.

A is the supporting frame or cabinet of any desired construction, upon the top B of which is secured a phonograph C of the usual type having the carriage D driven by means of the screw threaded shaft E engaging with the nut F, the shaft E being provided with the grooved pulley G over which a belt H passes, this belt engaging over the grooved pulley I secured upon the shaft J which is journaled in the frame K of my motor.

The motor consists of the operating lever 1, pivoted at the rear of the casing and extending through the front where it is provided with a platform 2, upon which the operator stands, it being intended that his weight shall act through a series of gear wheels governed by an escapement or governor to drive the phonograph cylinder.

The operating lever or platform 1 is connected with the gearing by means of the connecting rod 3, which is pivotally secured to the lever 4 having the sprocket chain 5 attached to its outer end and passing over the sprocket wheel 6, which is sleeved upon the shaft 7 journaled in the frame. To the other end of this sprocket chain I preferably attach a weight 8 to counterbalance the platform 2, and act to reset the phonograph and motor lever.

In the downward movement of the platform 2 motion is transmitted from the sprocket wheel 6 to the shaft 7 by means of the pawl 9 engaging with the ratchet wheel 10 which is secured to that shaft.

11 is a gear wheel also secured to the shaft, meshing with the pinion 12 upon the shaft 13, to which is likewise secured the gear wheel 14 meshing with the pinion 15, on the shaft 16 on which is also the gear wheel 17, which meshes with the pinion 18 on the shaft J to which is secured the worm gear 20 which meshes with the worm 21 upon the shaft 22, this latter being vertically arranged and extending through the top B of the cabinet. It is evident that if motion were imparted by the downward movement of the platform 2 to this train of gears the shaft E would be rapidly driven as long as the platform continues its downward movement and as soon as it reaches the end of the downward movement, the device would stop. As soon as the operator has stepped off the platform, the weight 8 would return it to its initial position ready for another operation.

In order to provide for persons of different weight imparting a different speed to the phonograph, I employ a governor or escapement of some type for regulating the speed of the drive shaft J.

The particular construction of governor which I have herein shown comprises the

worm 21, the vertical shaft 22 and cone pulley 23 upon said shaft, and shaft 24 and cone pulley 25 thereon, this shaft being journaled in stationary bearings and extending above the top B of the cabinet, being provided near its upper end with the circular gear 26, with which the segmental circular racks 27 upon the heads 28 of the governor weights 29 engage. These heads are pivoted upon the arms 30 formed at the upper end of the sleeve 31 which is keyed to the shaft 24. The arms 29 are provided at their outer ends with suitable fans 32. The sleeve 31 at its lower end is provided with a grooved collar 33 in which the bifurcated end of a lever 34 is adapted to engage. This lever at its other end is slotted or bifurcated to embrace a belt 35 stretched between the two cone pulleys, as plainly shown in Fig. 3. The motion being imparted through the mechanism described to the worm 21, will be transmitted through the belt 35 and the cone pulley 25 to the shaft 24, which will carry with it the sleeve 31 and cause the governor arms to be extended more or less toward a vertical line increasing or diminishing the amount of power required to turn the governor. The raising and lowering of these arms will raise or lower the lever 34 which will raise and lower the belt 35 upon the cone pulleys and govern the speed of the shaft 22, which in turn will control the speed of the shaft 18 through the gear wheel 20 and pinion 21. Upon the top of the shaft 22 is secured the disk 36 having the shoulder 37 arranged on one side thereof.

38 is a lever pivoted to the top B of the cabinet in proximity to this wheel and so arranged that it may be moved into or out of the path of the shoulder 37. The lever 38 is connected to the lever 39 by means of the connecting rod 40.

41 is a coin chute of any desired construction in which a coin may be inserted through the slot 42. At the lower end thereof is arranged the spring actuated tray 43 which the coin is adapted to strike in its descent through the chute, lowering the same and releasing the hook 44 from the bell crank 45, which is connected with lever 38, through bar 40, lever 39, and coil 54 whereupon the spring 46 will actuate said crank and through a connecting cord 54 extending from the lever 45 to lever 39 rock the lever 39 and withdraw the lever 38 from the path of the lug 37, and hold it in this position while the motor is operating.

The motor will continue to operate as long as the platform 2 descends, which I will regulate to be equal to the time required to move the carriage D the length of the cylinder C'. During this forward movement of the carriage the finger 47 pivoted at the front of the carriage trails along inclined rearwardly. When the operator steps off the platform and the weight 8 begins to lower, the weight draws the finger to its vertical position, by means of the cord 48 connected to the extension 49

above the pivotal point. In turning to its vertical position, it will lift the forward edge of the carriage and with it the nut F from its drive shaft, allowing the weight in its downward motion to return the carriage to its initial position, riding meanwhile upon the end of the finger as shown in Fig. 5. When the carriage reaches the end in returning the end of the finger enters the aperture 50, allowing the carriage to fall, with the nut F upon the drive shaft. In the return of the carriage the finger strikes the end of the lever 39, and rocks it as shown in Figs. 4 and 5, throwing the lever 38 into locking position in relation to the disk 36—locking that disk and the motor. The rocking of the lever 39 also draws on the cord 54 rocking the lever 45 against the tension of the spring 46, and re-engaging it with the hook 44, so that the machine cannot again be operated except by the insertion of a proper coin. I have shown this lock operated by the return of the phonograph, but it is obvious that it may be done in any other suitable manner, for instance, by the return of the lever 1, or in any other manner after the motor has run the predetermined period due to the arrangement of the length of stroke of the lever 1.

What I claim as my invention is—

1. The combination with a phonograph, of a regulated motor therefor, having an actuated period corresponding to the driving interval of the carriage and automatic means for re-setting it for each actuation, substantially as described.

2. The combination with the phonograph, of a regulated motor therefor having an actuating period corresponding to the driving period of the carriage, an independent automatic re-setting device for the motor, and a re-setting device for the carriage, substantially as described.

3. The combination with a phonograph, of a regulated motor therefor, having an actuating period corresponding to the driving interval of the carriage, an independent automatic re-setting device for the motor, said re-setting device also forming the re-setting device for the carriage, substantially as described.

4. The combination with a phonograph, of a motor therefor, comprising an oscillating platform and a train of gearing actuated therefrom, of a weight for returning the platform to its initial position, and an independent connection from said weight to the phonograph carriage, substantially as and for the purpose described.

5. The combination with a phonograph, of a motor therefor, comprising an oscillating platform, a train of gearing actuated thereby, an automatic governor between the gearing and the phonograph cylinder, a weight for returning the platform to its initial position, and a connection from said weight to the phonograph carriage, substantially as described.

6. The combination with a phonograph, its

carriage and a motor therefor, comprising a train of gearing, a lever forming a platform upon which the operator is adapted to stand, and a winding up connection from said lever to the motor, substantially as described.

7. In a phonograph, the combination with a carriage of a motor for driving it forward and a motor for returning it, of the finger 47 pivoted to the carriage normally held and trailing in an inclined position in the forward movement of the carriage and adapted to be rocked to a vertical position in the return movement, substantially as described.

8. The combination with a phonograph cyl-

inder and its carriage, of a motor for driving it forward and a motor for returning it, of the finger 47 trailing in an inclined position in the forward movement of the carriage and adapted to be rocked to a vertical position in the return movement and a well at the return movement into which said finger drops, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK S. CHURCH.

Witnesses:

M. B. O'DOHERTY,

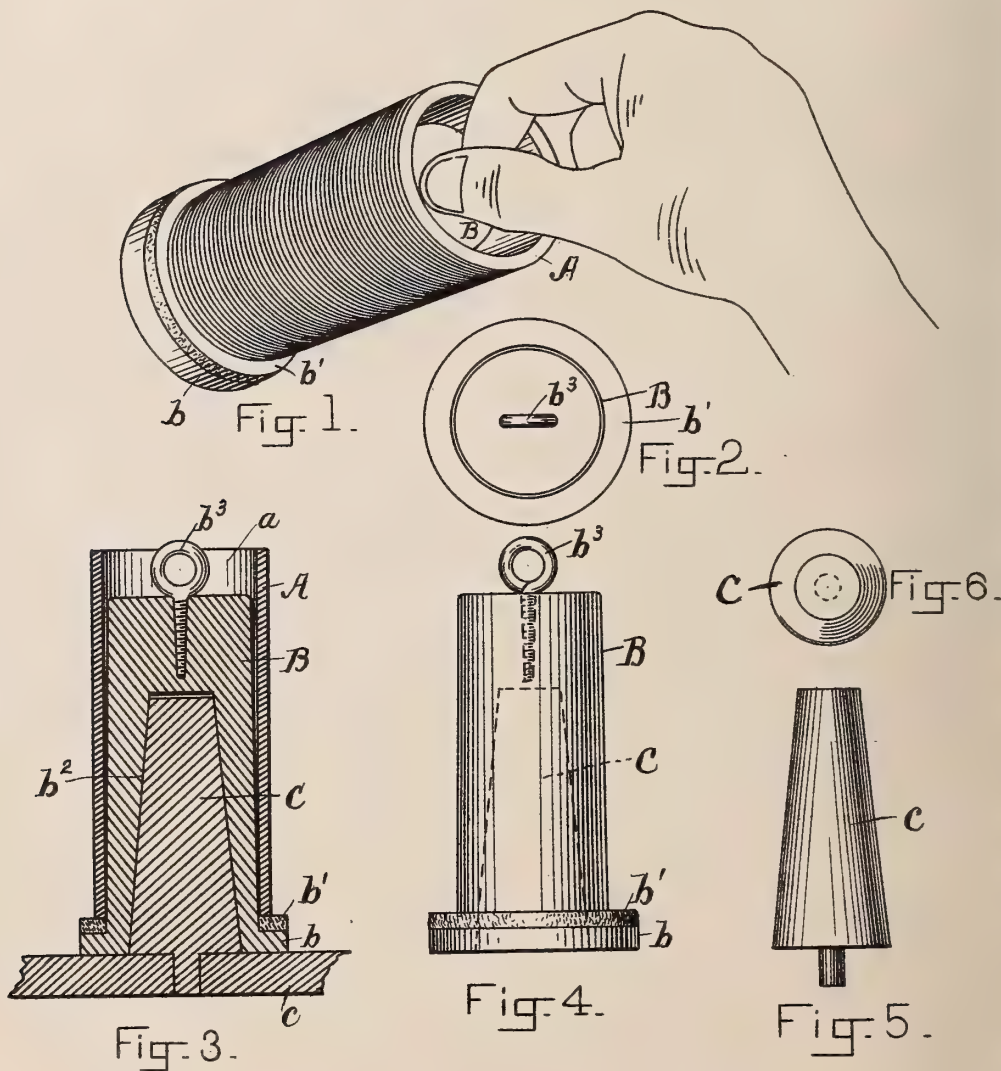
N. L. LINDOP.

(No Model.)

L. B. GRAY.
HOLDER FOR PHONOGRAPH CYLINDERS.

No. 529,904.

Patented Nov. 27, 1894.



WITNESSES:
Thomas H. Seely.
H. V. Raymond & Co.

INVENTOR:
Lawrence B. Gray

UNITED STATES PATENT OFFICE.

LAWRENCE B. GRAY, OF BOSTON, MASSACHUSETTS.

HOLDER FOR PHONOGRAPH-CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 529,904, dated November 27, 1894.

Application filed January 12, 1894. Serial No. 496,628. (No model.)

To all whom it may concern:

Be it known that I, LAWRENCE B. GRAY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Holders for Phonograph-Cylinders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The record cylinders of phonographs, owing to the material of which they are made and the nature of their recording surfaces, must be very delicately and carefully handled. It is a very common thing in the operation of the phonograph to remove the record cylinder from the machine, place it in a drawer or other receptacle until needed, and then to replace it in the machine. The record cylinder is held while in the machine upon a part called a shaft or mandrel, which is of a size to fit the bore of the cylinder. In removing the cylinder from this mandrel, it must be taken hold of by the finger and thumb placed in the inside or cavity of the cylinder, and opened or spread apart to bear against the inside, and in no event should a finger or thumb be placed against the outer surface of the cylinder, either in removing it from the mandrel, or in placing it in its receptacle, or at any other time. It is desirable, therefore, to use this method of handling it as unfrequently as possible, and I have devised a holder which permits it to be handled with much less liability of breakage or injury to its outer surface.

The holder consists of a stud of a size to enter the bore or cavity of the record cylinder, and to extend through or very nearly through it, having at its base a flange upon which may be placed a washer of felt or similar material, and which acts as a foot or rest for the support of the cylinder. The opposite or upper end of the holder has in or extending from its center a short handle or thumb-piece, by which it may be grasped.

The holder is hollow, and is carried or supported by a pin or peg, the pins or pegs preferably being arranged to extend upward from the bottom of a drawer or case.

The invention will be more particularly described in connection with the drawings.

Figure 1 is a view in perspective of a record cylinder upon the holder, the holder being represented as grasped by means of its thumb-piece. Fig. 2 is a plan view of the holder, the record cylinder being removed from it. Fig. 3 is a vertical central section of the holder, its supporting pin, a portion of a drawer bottom, and the record cylinder. Fig. 4 is a view in elevation of the holder showing its holding pin by dotted outline. Fig. 5 is a view in elevation of the holding pin, and Fig. 6 is a view in plan thereof.

A is the record cylinder of the phonograph. It is cylindrical in shape, and has a bore or cavity *a* open at both ends.

B is the holder. Its stud is of a size to enter the cavity of the cylinder, and preferably to substantially fill the cavity from one end to or very nearly to the other end thereof, and it has at its lower end a flange *b*, upon which is mounted a felt or other washer *b'*, upon which one end of the record cylinder rests. The holder also has the pin-holding cavity or hole *b²* extending from its lower end or bottom upward, and at the upper end of the holder there is the grasping extension *b³*, which is represented in the drawings as a screw-eye screwed into the upper end of the holder; but any other form of grasping extension may be employed.

C is a pin carried by a drawer or case bottom *c*, or other holding device, and permanently secured to it, and upon which the holder B is placed. I prefer that this pin be of conical shape, and that the recess *b²* of the holder be of like shape, but of course, do not confine myself to this form.

The holder, or that portion of it in the bore of the cylinder is preferably shorter than the cylinder in order that there may be no projection above the upper edge of the cylinder, the cylinders being generally held in a case having a cover lined on its under surface with felt or other soft material, and closing upon the ends of the cylinders, and thereby holding them against the bottom of the case so as to prevent their having endwise movement in the case. It will be understood that it is very often necessary to transmit or move

the case with the cylinders in it from one place to another.

In lieu of providing the holder with a pin-holding cavity, the pin may be attached to the holder to extend downwardly from its base, and the hole for receiving the pin may be formed in the bottom of the case or drawer.

In removing and replacing the cylinder, the end of the holder may be placed against the mandrel of the machine, and the cylinder slid directly upon it by means of a thin blade pressed against the inner end of the cylinder to force it off the mandrel upon the holder, and the cylinder may be returned from the holder to the mandrel in the same way; that is, the end of the holder may be held against the mandrel, and the cylinder removed from the holder to the mandrel. This method of placing and replacing the cylinder is used when the stud is enough smaller than the cylinder to permit its smallest end to seat on the rest at the bottom of the holder. It will be understood that the cavity or bore of the cylinder is slightly tapering, and that the mandrel of the phonograph is correspondingly tapering, and in some cases the holder is made tapering and of the size of the mandrel, and when so formed, it will be necessary to remove the cylinder from the holder by slipping the cylinder slightly off the stud, thus giving room for the insertion of two fingers or the finger and thumb into the bore of the cylinder at the smaller end, and it is then entirely removed so held and placed upon the mandrel, and is removed from the mandrel and placed upon the holder in the same way.

Whichever way is used for transferring the

cylinder from the mandrel to the holder, the holder acts as a secure means for supporting the cylinder when not in use, and for transferring it from the machine to its holding receptacle or pin, and vice versa.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. A holder and transferrer for a phonograph record cylinder comprising a stud to enter the cavity of the cylinder having a rest at its lower end and a grasping device at its upper end, as and for the purposes described.

2. In a phonograph record cylinder holder and transferrer, a portable stud adapted to enter the bore of the cylinder having at its lower end a rest and provided with a cavity opening from its lower end to receive a holding pin.

3. A portable holder and transferrer for a phonograph record cylinder, having a stud to enter the cavity of the cylinder but of a length less than the length of the cylinder, and a foot or rest for the cylinder attached to the stud to be movable therewith, as and for the purposes described.

4. As a means for holding phonograph record cylinders, a pin C, and a cylinder holder having a foot or rest against which one end of the cylinder abuts, a grasping device and a hole to receive the holding pin, substantially as described.

LAWRENCE B. GRAY.

Witnesses:

F. F. RAYMOND, 2d,
J. M. DOLAN.

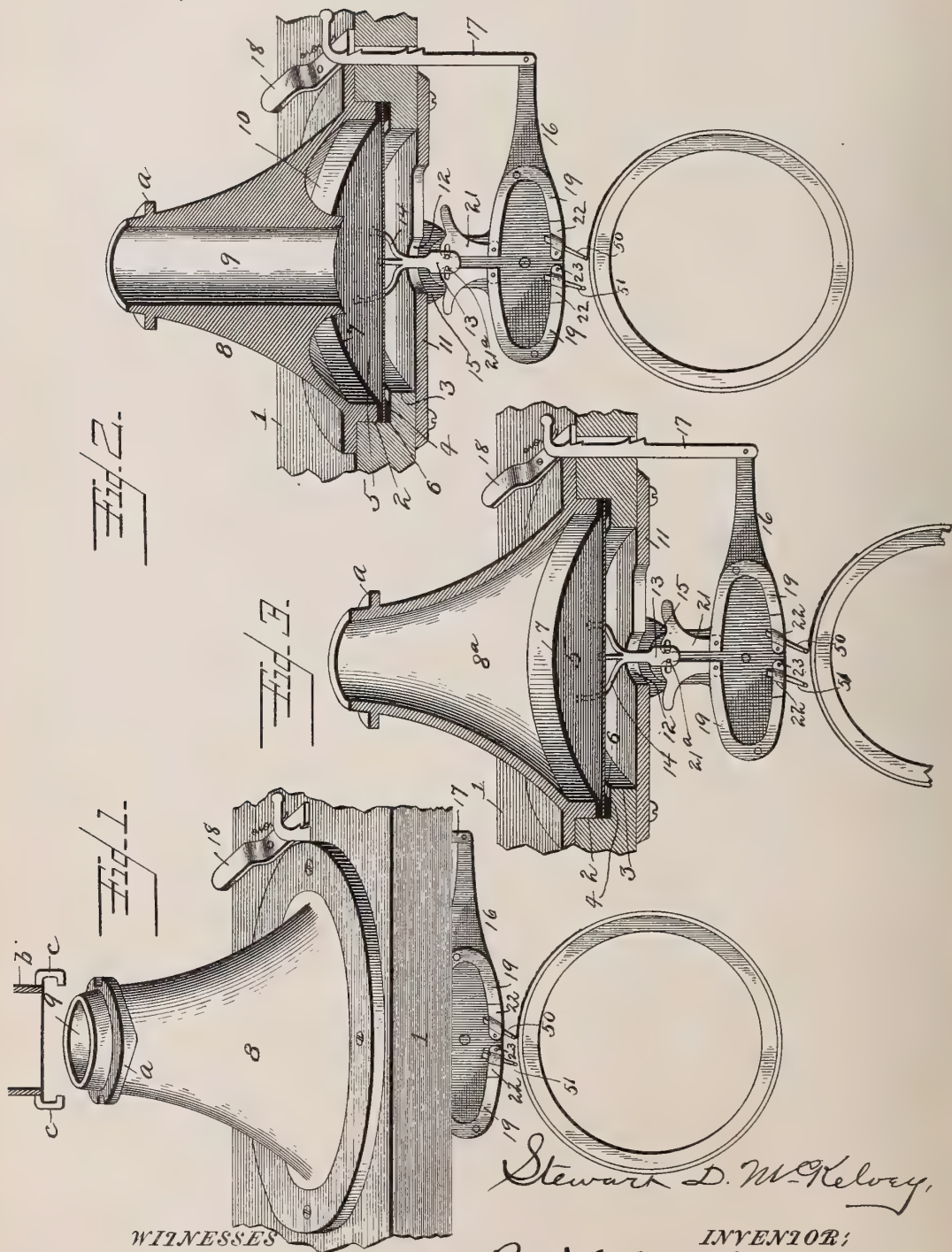
(No Model.)

2 Sheets—Sheet 1.

S. D. McKELVEY.
PHONOGRAPH.

No. 531,690.

Patented Jan. 1. 1895.



WITNESSES

H. Earl McKelvey
Thomas C. Turpin

Stewart D. McKelvey,

INVENTOR;

By W. F. Fitzgerald & Co.,

Attorneys.

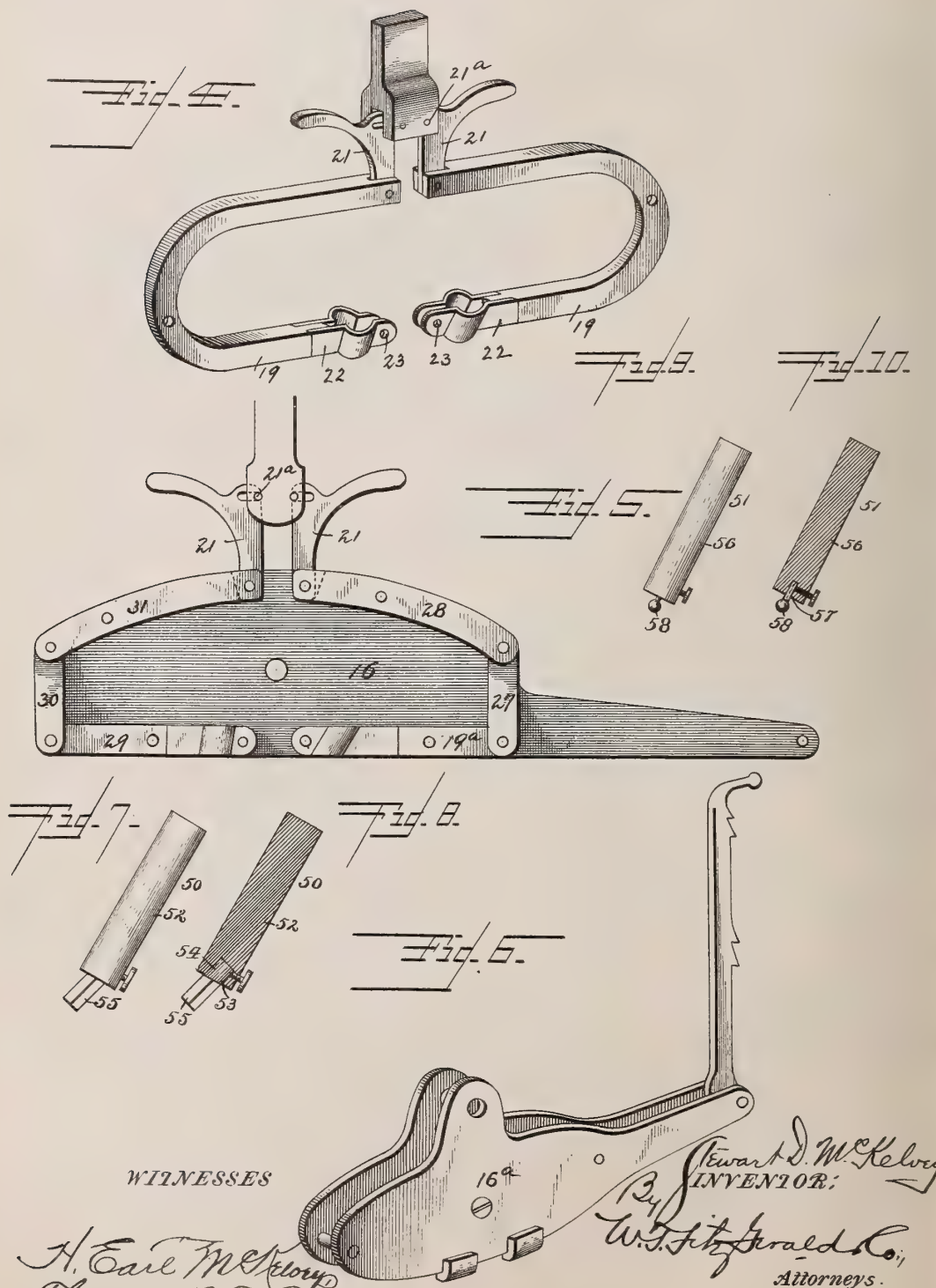
(No Model.)

2 Sheets—Sheet 2.

S. D. McKELVEY.
PHONOGRAPH.

No. 531,690.

Patented Jan. 1, 1895.



UNITED STATES PATENT OFFICE.

STEWART DIXON McKELVEY, OF CANTON, OHIO, ASSIGNOR OF ONE-THIRD
TO JOSEPH A. LINVILLE, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 531,690, dated January 1, 1895.

Application filed March 31, 1892. Serial No. 427,298. (No model.)

To all whom it may concern:

Be it known that I, STEWART DIXON McKELVEY, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Phonographs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to improvements in phonographs and is designed more particularly as an improvement upon the phonographs disclosed in my prior applications, filed November 5, 1891, and January 8, 1892, Serial Nos. 411,001 and 417,433, respectively.

The several objects of my present invention, among other things, are, first, to provide a diaphragm chamber of such a form and construction that the sound waves will be concentrated and their impact exerted upon the center of the diaphragm so as to amplify the vibrations thereof; second, to provide such mechanism intermediate the diaphragm and the recording style that the vibrations of the diaphragm will be amplified in transit and the said style consequently caused to make more positive indentations upon the recording tablet so as to amplify the movements of the reproducing style when the same is thrown into operation; third, to provide such mechanism intermediate the reproducing style and the diaphragm that the vibrations of the reproducing style will be amplified in transit to the diaphragm and the latter consequently caused to give forth a greater volume of sound; fourth, to provide such a connection between the said intermediate amplificatory mechanisms and the diaphragm that either of the said mechanisms may be readily disconnected from the diaphragm when not in use so as not to retard the vibrations thereof; fifth, to so support the mechanisms carrying the recording and reproducing styles that the same may be alternately thrown into operation and held in such position; sixth, to provide such a connection of the recording and reproducing styles to the amplificatory mechanism that the said styles may be readily removed when desirable, and, seventh, to so detachably connect a concen-

trator nipple to the mouth of the diaphragm chamber that an escape of sound, except through the concentrator, will be prevented.

Other objects and advantages will be fully understood from the following description and claims, when taken in conjunction with the accompanying drawings, in which—

Figure 1 is a perspective view of my improved phonograph. Fig. 2 is a vertical, diametrical section of the same. Fig. 3 is a vertical, diametrical section disclosing a modified construction of diaphragm chamber. Fig. 4 is a perspective view of the intermediate amplificatory lever mechanism, together with a portion of the drop-stud of the diaphragm, removed. Fig. 5 is an elevation of a modified form of the amplificatory lever mechanism. Fig. 6 is a perspective view of a modified construction of support for the intermediate amplificatory mechanism. Fig. 7 is a side elevation of the recording style. Fig. 8 is a longitudinal section of the same. Fig. 9 is a side elevation of the reproducing style, and Fig. 10 is a longitudinal section of the same.

Referring by numerals of designation to the said drawings and more particularly to Figs. 1, 2 and 4 thereof, 1, indicates the diaphragm carriage of my improved phonograph, which may be formed from any suitable material and may be fed through the medium of any suitable mechanism, as may also the recording tablet which may be in the form of a cylinder, as illustrated, a flat surface, or a ribbon, as is most desirable.

Formed in the carriage 1, as better illustrated in Fig. 2 of the drawings, is a bore 2, and a counter-bore 3, whereby it will be perceived that a shoulder 4, is provided for the support of the diaphragm 5, which preferably rests directly upon an insulating cushion-annulus 6, by reason of which the vibrations of the carriage will be prevented from affecting the said diaphragm. Resting upon the upper side of the diaphragm 5, is an insulating annulus 7, for the same purpose as the annulus 6; and resting upon the said annulus 7, is the lower edge of the diaphragm chamber 8, which may be formed from any suitable material and is preferably provided with a lateral flange, as illustrated, for the passage of screws through the medium of which it is connected

to the carriage 1, as illustrated. This chamber 8, which is preferably of the general bell-shaped form employed, comprises a central bore 9, which extends from its upper end to a point adjacent to the diaphragm, and has its lower end flaring, as shown, so as to allow of a free egress, and ingress of the sound waves, and the convex-curved chamber 10, which surrounds the lower end of the bore 9, and serves, in practice, to lead the sound waves rising from the diaphragm at points remote from the center thereof, into the bore 9, through which the said waves are discharged.

In the practice of my invention I prefer to have the walls of the bore 9, and the chamber 10, very smooth so as not to retard the passage of the sound; and by the provision of a bore, such as 9, in the diaphragm chamber it will be readily perceived that the sound waves are led directly to the diaphragm and the vibrations of said diaphragm amplified, which is an important desideratum.

Preferably formed integral with the diaphragm chamber 8, adjacent to the upper end thereof, is a collar flange *a*, which is provided at diametrically opposite points with notches, as illustrated, and has its lower side inclined from the said notches to a point approximately midway of the same, for a purpose presently set forth.

b, indicates the concentrator nipple, which is preferably of a cylindrical form, as illustrated, and is designed to effect a connection of a concentrator, or the like, to the diaphragm chamber.

Formed integral with the nipple *b*, which is preferably tapered toward its upper end, and arranged at diametrically opposite points, are two angular lugs *c*, which are designed to take through the notches in the collar *a*, and, when the nipple is turned, to engage the lower side of said collar to draw the nipple tightly down upon the upper end of the diaphragm chamber so as to absolutely prevent the escape of sound between the meeting ends of the diaphragm chamber and the concentrator, or the like, connected thereto.

Connected to the lower side of the carriage 1, by screws, or other suitable devices, is a hanger plate 11, which is provided with an aperture 12, for the passage of the drop-stud 13, which is connected to the diaphragm 5, by the needles of filaments 14, which for the reasons disclosed in my prior applications, are each preferably arranged in a different nodal circle, as illustrated.

Connected to or formed integral with the hanger-plate 11, and depending therefrom is a lug 15, to which is pivotally connected the ear branch of the rocking bar 16, which is provided at one end with a loosely connected handle branch 17, through the medium of which the said bar is rocked to throw one of the styles into engagement with the recording tablet and the other style out of engagement therewith. This handle branch 17, as illustrated, is provided at intervals in its length

with bevel teeth which are designed and adapted to engage a spring-pressed keeper latch 18, which is mounted on the carriage 1, and serves, in practice to hold the bar 16, in its adjusted position. Pivotally connected to the bar 16, and preferably at equidistant points from the vertical line of the drop-stud 13, are two approximately U-shaped levers 19, which serve to amplify the vibrations of the diaphragm, as presently described. Connected in a pivotal manner to the upper ends of the levers 19, are connecting arms 21, which are preferably formed from spring metal and are provided adjacent to their upper ends with slots to engage the transverse pins 21^a, carried by the drop-stud 13, as better illustrated in Fig. 4 of the drawings.

By the provision of the connecting arms 21, it will be readily perceived that when not in use one of the U-shaped levers 19, may be readily disconnected from the drop-stud and its weight taken off the diaphragm, whereby the latter is rendered less stiff and more sensitive and is consequently better adapted to actuate the style carried by the connected lever or be vibrated by said style.

Fixedly connected to the lower ends of the levers 19, are spring clamping branches 22, which are provided at an intermediate point in their length with curved portions, as illustrated, designed to seat the shank of the recording and reproducing styles 50, 51, upon which the clamping branches are caused to bind by the screws 23, as better illustrated in Fig. 1, by reason of which construction it will be readily perceived that the styles may be readily removed when desirable.

By the provision of the U-shaped levers 19, pivoted adjacent to their middles, approximately as shown, it will be readily perceived that the vibrations of the diaphragm will be amplified in transit to the recording style, while the vibrations of the reproducing style will be amplified in transit to the diaphragm, for a purpose hereinafter more fully set forth.

The shank 52, of the recording style 50, as better illustrated in Fig. 8, of the drawings, is provided in its lower end with a socket 53, which is preferably of a circular form in cross section and is pitched at an angle to the longitudinal plane of the said shank for a purpose presently perceived. Seated and detachably secured in the socket 53, of the shank 52, (preferably by a binding or set screw as shown) is the cylindrical shank 54, of the style point 55, which point is of a rectangular form in cross section, as illustrated, whereby it will be readily perceived that when one cutting corner is worn out, the point may be turned and another corner presented to the tablet. The shank 56, of the reproducing style 51, is also provided in its lower end with a socket 57, to receive the point 58, which is preferably of a blunt form, as shown, and is preferably secured in the socket of the shank by a binding or set screw, as illustrated.

In Fig. 3 of the drawings I have illustrated

a construction of phonograph, which is similar in all respects to that shown in Figs. 1 and 2, with the exception that the diaphragm chamber, 8^a, is made in the well-known bell-shape and has its interior flared from its upper to its lower end, which is preferable in those cases where it is desirable for the diaphragm to vibrate in but a moderate degree.

In Fig. 5 of the drawings I have illustrated a modification of the amplificatory levers, which are designed and adapted to amplify the vibrations of the diaphragm in a greater degree or ratio than the levers disclosed in Figs. 1 to 4, inclusive. Referring by numerals of designation to the said Fig. 5, 16, indicates a rock-bar which is similar to that employed in the construction before described and is designed and adapted to be rocked or adjusted in a corresponding manner to throw one style into engagement with the recording tablet and the other style out of engagement therewith, as before described. Pivotally connected at a point off its middle to the bar 16, and preferably adjacent to the lower edge thereof is a lever 19^a, which is preferably provided with clamp branches of the construction described for the attachment of the recording style. Pivotally connected to the shorter end of the lever 19^a, is a link 27, which is also pivotally connected to the long end of a lever 28, which lever 28, is preferably provided at its shorter end with one of the engaging arms 21, although it might be connected directly to the drop-stud 13, if desirable. By reason of connecting the short end of the lever 28, to the stud 13, and the long end of said lever to the short end of the lever 19^a, it will be readily seen that when the diaphragm is vibrated, the primary degree of movement will be transmitted to the short end of the lever 28, and the longer end of said lever will be caused to move a greater distance, and it being connected to the short end of the lever 19^a, will cause the longer end of said lever 19^a, to move a still greater distance, whereby it will be readily perceived that the style carried by the long end of the lever 19^a, will be caused to move a much greater distance than the vibratory movement of the diaphragm and will be caused to make much more positive indentations than when the vibratory movement is transmitted direct from the diaphragm to the recording style.

Pivotally connected at a point off its middle to the bar 16, and preferably adjacent to the lower edge thereof, is a lever 29, which has its short end preferably provided with clamping branches such as before described to hold a reproducing style, while its long end is connected by a link 30, to the short end of a lever 31, which has its long end connected in turn with the drop-stud 13, whereby it will be readily perceived that the vibrations of the reproducing style will be amplified in transit

to the diaphragm, by reason of which the volume of reproduced sound will be materially greater than the volume of sound recorded upon the recording tablet.

By the provision of amplificatory mechanism intermediate the diaphragm and the recording style, and intermediate the reproducing style and the diaphragm it will be readily perceived that when the device is adjusted to record, a greater volume of sound will be recorded upon the recording tablet than that introduced into the diaphragm chamber, and that when the device is adjusted to reproduce, a greater volume of sound will be discharged from the diaphragm chamber than that recorded upon the recording tablet, which is a highly important desideratum.

Although I have described a specific number of amplificatory levers for the purpose stated, yet I do not desire to be confined to the same, nor do I desire to confine myself to the amplificatory levers of any specific form or to any specific manner of connecting the same to the drop-stud.

In Fig. 6 of the drawings, I have disclosed a modified construction embodying two parallel rocking bars 16^a, which are suitably connected together and are designed to receive between them the amplificatory levers before described. This modified construction is designed more especially for use in those cases where the feed of the carriage is transverse to the record line of a flat surface tablet, in which cases it will be readily perceived that the two bars will prevent the objectionable lateral thrusts of the styles so incidental to lateral feed of the carriage, as set forth.

Although I have, in some particulars, specifically described the construction and relative arrangement of the several elements of my improved phonograph, yet I do not desire to be confined to the same, as I reserve the right to make such changes or modifications as fairly fall within the scope of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a phonograph, the combination with a diaphragm; of a style and amplificatory mechanism intermediate the diaphragm and style; for the purpose set forth.

2. In a phonograph, the combination with a recording tablet; of a diaphragm, a style, and amplificatory mechanism intermediate the diaphragm and style; for the purpose set forth.

3. In a phonograph, the combination with a diaphragm; of a recording style, and amplificatory mechanism adapted to amplify the vibrations of the diaphragm while in transit to the style; for the purpose set forth.

4. In a phonograph, a reproducing style, in combination with a diaphragm, and amplificatory mechanism intermediate said style and

diaphragm adapted to amplify the vibrations of the style while in transit to the diaphragm; for the purpose set forth.

5 5. In a phonograph, the combination with a recording tablet, and a diaphragm; of a recording style, amplificatory mechanism intermediate the diaphragm and said style adapted to amplify the vibrations of the diaphragm while in transit to the style, a reproducing style, and amplificatory mechanism intermediate the reproducing style and the diaphragm adapted to amplify the vibrations or movements of said style while in transit to the diaphragm; for the purpose set forth.

15 6. In a phonograph, the combination with a recording tablet, and a diaphragm, the rocking bar, a suitable means for adjusting and adjustably fixing said bar, a recording style, amplificatory mechanism intermediate the diaphragm and the recording style, the reproducing style, and amplificatory mechanism intermediate the reproducing style and the diaphragm; for the purpose set forth.

25 7. In a phonograph, the combination with a recording tablet; of a diaphragm chamber, a diaphragm mounted in said chamber, a recording style, amplificatory mechanism intermediate the diaphragm and said style, a reproducing style and amplificatory mechanism intermediate said style and the diaphragm chamber; substantially as set forth.

35 8. In a phonograph, the combination with a diaphragm; of a recording style, an amplificatory lever intermediate the diaphragm and style, a reproducing style, and an amplificatory lever intermediate said style and diaphragm; substantially as set forth.

40 9. In a phonograph, the combination with a diaphragm; of a recording style, and a system of levers intermediate the diaphragm and said style, so arranged, connected together and connected to the diaphragm and style as to amplify the vibrations of the former while in transit to the latter; substantially as and for the purpose set forth.

45 10. In a phonograph, the combination with a diaphragm; of a reproducing style and a system of levers intermediate the reproducing style and the diaphragm, connected together and connected to the style and dia-

phragm so as to amplify the vibrations of the former while in transit to the latter; substantially as and for the purpose set forth.

11. In a phonograph, the combination with a recording tablet; of a diaphragm, a recording style, a system of levers intermediate the diaphragm and said style so arranged, connected together and connected to the diaphragm and style as to amplify the vibrations of the former while in transit to the latter, a reproducing style, and a system of levers intermediate the reproducing style and the diaphragm so arranged, connected together and connected to the style and diaphragm as to amplify the vibrations of the former while in transit to the latter; all substantially as and for the purpose set forth.

12. In a phonograph, substantially as described, the combination with the carriage, and the hanger plate connected thereto and having a depending branch; of the parallel, connected rocking bars pivotally connected to the hanger plate, and carrying the style carrying mechanism between them; substantially as specified.

13. In a phonograph, a recording style, substantially as described, comprising a shank and a point of rectangular form in cross-section detachably connected to the shank; substantially as and for the purpose set forth.

14. In a phonograph, substantially as described, the combination with a style shank having a socket in its lower end pitched at an angle to its longitudinal plane; of a point of rectangular form in cross section seated in the socket of the shank, and a suitable means for removably securing the point in the socket of the shank; substantially as specified.

15. An improved diaphragm chamber for phonographs, comprising a central, cylindrical, longitudinal bore having its lower end flared, and a convex curved annular chamber surrounding the lower end of the central bore, substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

STEWART DIXON McKELVEY.

Witnesses:

H. EARL. McKELVEY,
W. P. WELLS.

(No Model.)

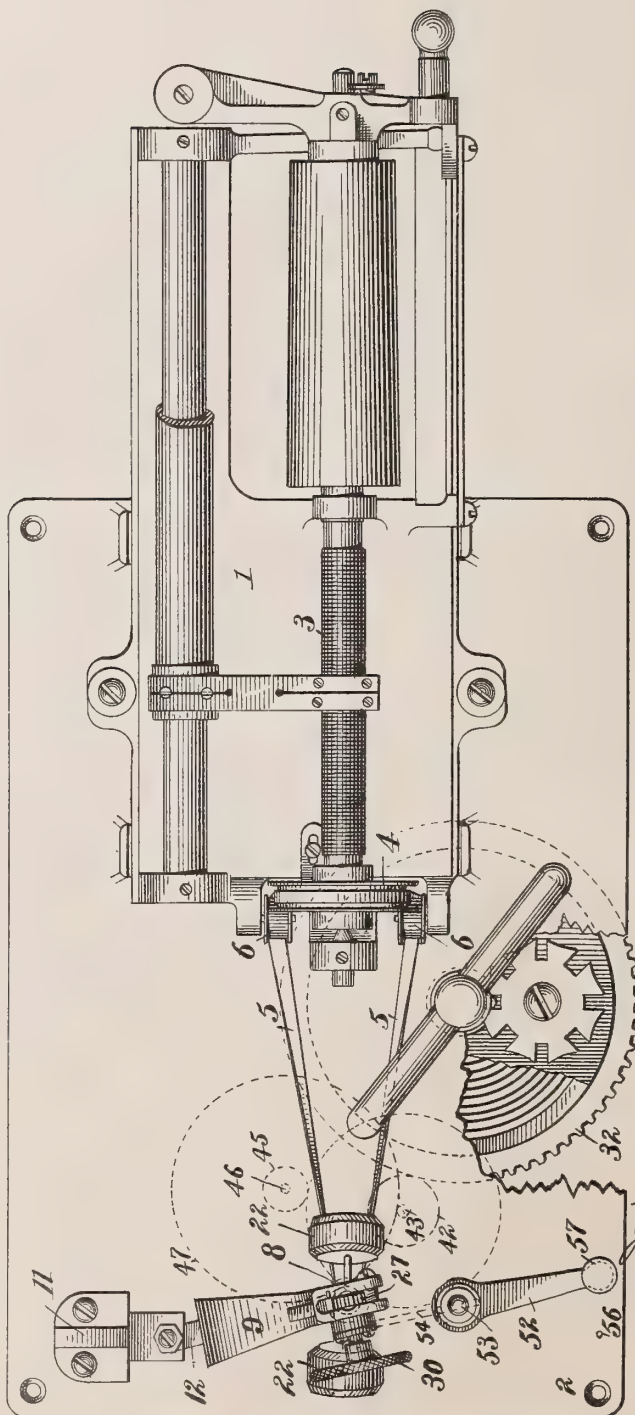
4 Sheets—Sheet 1.

J. BROICH.
PHONOGRAPH.

No. 532,718.

Patented Jan. 15, 1895.

Fig. 1



Witnesses
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By *Knights Bros*
His Attorneys

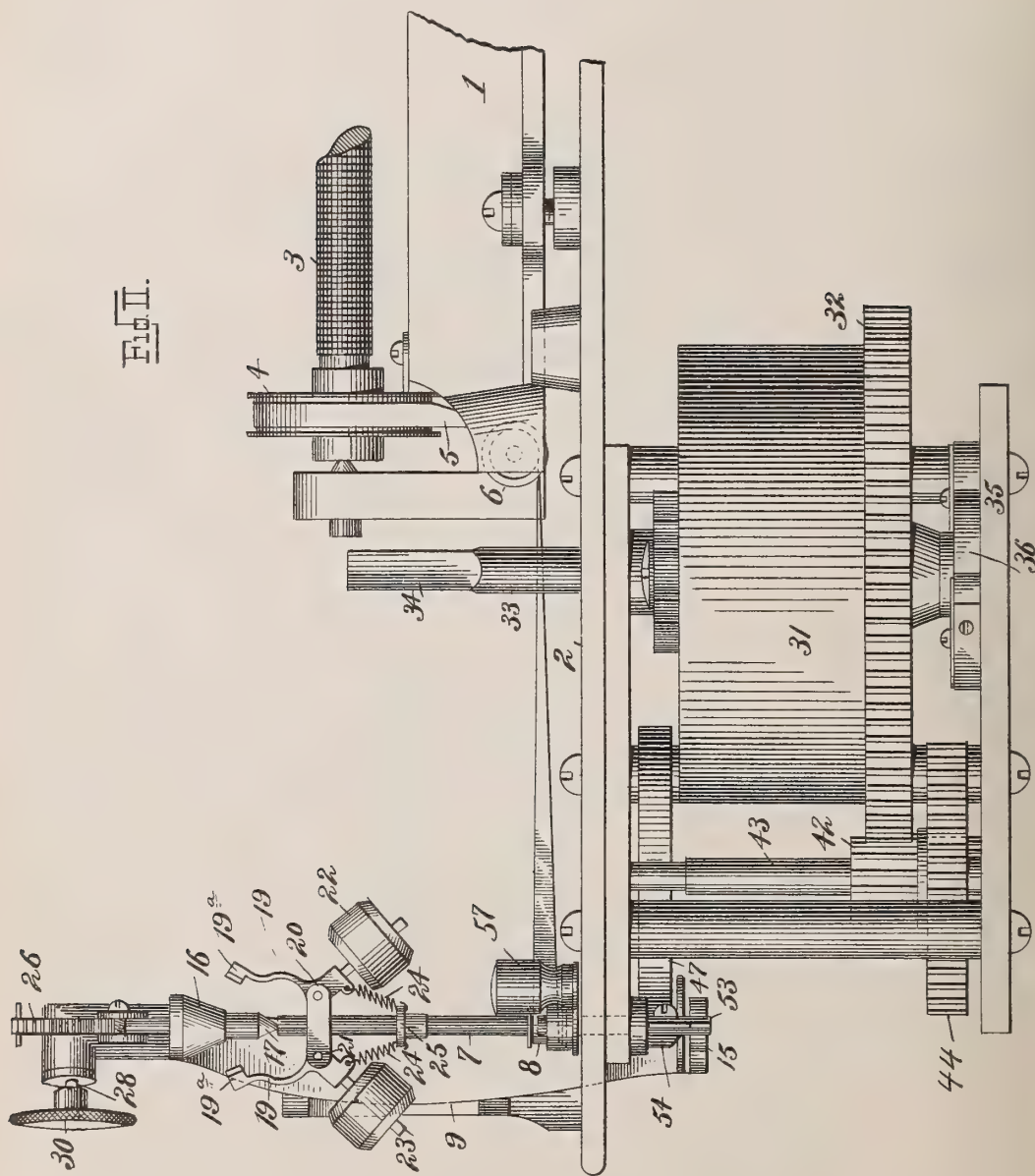
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4 Sheets—Sheet 2.

J. BROICH.
PHONOGRAPH.

No. 532,718.

Patented Jan. 15, 1895.



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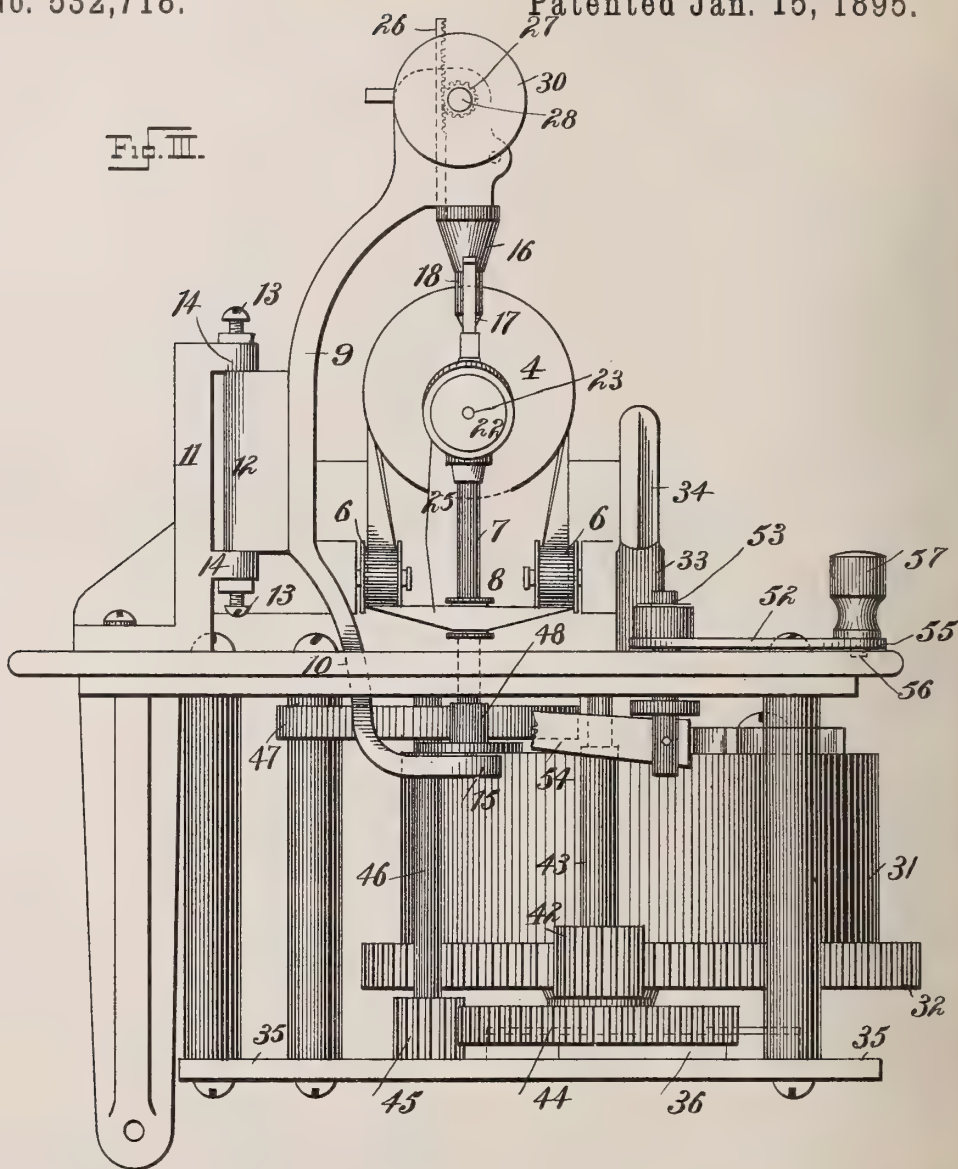
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J. BROICH.
PHONOGRAPH.

No. 532,718.

Patented Jan. 15, 1895.

Fig. III.



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His Attorneys.

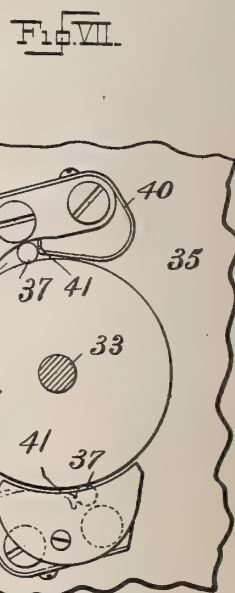
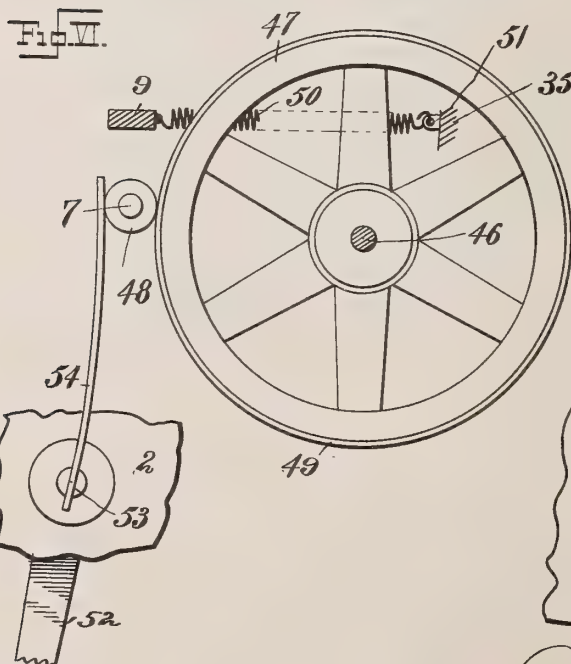
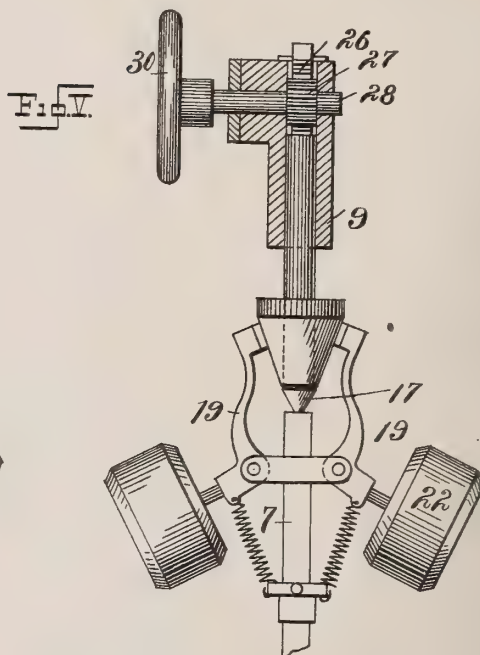
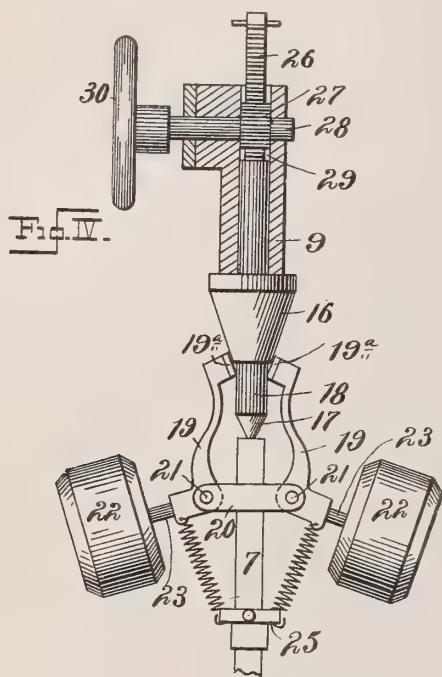
(No Model.)

4 Sheets—Sheet 4.

J. BROICH.
PHONOGRAPH.

No. 532,718.

Patented Jan. 15, 1895.



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His Attorneys.

UNITED STATES PATENT OFFICE.

JOSEPH BROICH, OF BROOKLYN, ASSIGNOR TO FREDERICK PEARCE, OF
NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 532,718, dated January 15, 1895.

Application filed December 13, 1893. Serial No. 493,517. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH BROICH, a citizen of the United States, residing in Brooklyn, county of Kings, and State of New York, have invented a new and useful Improvement in Phonographs, of which the following is a specification.

My invention relates more particularly to a novel method and apparatus for propelling the cylinder of a phonograph and automatically and manually regulating its speed, combining therewith an attachment for stopping its movement at any point, as will be explained.

My invention consists in details of construction hereinafter specifically referred to and pointed out in the claims.

Referring to the accompanying drawings which form a part of this specification, Figure I represents a plan view showing the phonograph approximately complete together with the operating mechanism. Fig. II is a side elevation of the operating mechanism. Fig. III is an end view of the device. Figs. IV and V show the governor in its two extreme positions. Fig. VI is a detail view of a brake mechanism. Fig. VII is a detail view of a clutch mechanism.

In the accompanying drawings, in which similar numerals of reference indicate corresponding parts in the several views, the numeral 1 indicates the mechanism of a phonograph which is of the well known construction, and 2 is the table or plate upon which the phonograph is usually carried.

3 is the main cylinder-driving shaft and combined feed-screw of the phonograph, and 4 is a grooved pulley carried by said shaft.

5 is the belt that passes over said pulley, and is guided by rollers 6, suitably journaled in the mechanism in the frame of the phonograph over which the belt 5, passes to the pulley 4 in the manner shown.

7 is the governor shaft having a pulley 8 over which the belt 5 passes, whereby as said shaft is rotated, the cylinder-driving shaft and combined feed-screw 3, will be correspondingly turned. The shaft 7, is shown vertically supported, and for the purpose of providing continuous frictional contact between said shaft and its driving wheel disk

or element, said shaft is so carried that it may have lateral movement. For this purpose I have shown a suitable bracket or frame 9, vertically arranged, the lower portion of which passes through a suitable slot or opening 10, in the plate or table 2. The bracket or frame 9, is pivotally carried by a vertical standard 11, secured to the plate 2, said bracket having a side projection or offset 12, that is pivoted to said bracket 11, as for instance, by screws 13 carried by lugs 14 on the standard 11, said screws being suitably arranged to enter sockets in projection 12, as shown in Fig. III. By this means the bracket or frame 9, and the governor shaft 7, which is carried thereby can be swung laterally, as hereinafter more fully explained. The lower portion of bracket or frame 9 has a bearing 15, in which the lower end of the governor shaft 7, is stepped, as shown in Fig. III. For the purpose of reducing friction on said shaft 7 as much as possible, and to provide for the action of the governor-cone 16, the upper end of said shaft is shown receiving the pointed or cone-like end 17 of a rod 18, that is carried by and depends from the upper portion of the bracket 9. By this means the shaft 7, is vertically sustained in the bracket 9, and ease of rotation is insured.

19 are governor arms, that are pivotally carried by the shaft 7, and are shown sustained on said shaft by lugs 20, carried by said shaft to which the arms 19 are pivoted by pins 21. The arms 19 extend parallel to the shaft 7 and carry weights 22 on oppositely extending rods 23, as shown. For convenience of manufacture the arms 19, are shown in substantially bell-crank form, the lower members of which arms are shown connected by springs 24, with the shaft 7, said shaft being shown provided with a collar 25, to which said springs are connected. The action of the governor arms constructed as above specified is such, that when the shaft 7 rotates, the weights 22, will be caused to move outwardly in proportion to the speed of rotation of said shaft, whereby the upper ends 19^a will be caused to move toward said shaft in a corresponding degree, the springs 24, when used, acting to retard the outward movement of said arms. The upper ends 19^a, of the arms

19, have friction faces of suitable construction that are adapted to bear against the cone 16 as in Fig. V. For the purpose of causing the arms 19 to bear with more or less force upon the cone 16 in proportion to the speed of rotation of the shaft 7, so as to more or less retard the rotation of said shaft, as and when desired, said cone is made vertically adjustable on the rod 18, and for this purpose said cone is shown provided with a vertically extending toothed rack 26, that meshes with a pinion 27 carried on a shaft 28 journaled in the upper part of the bracket 9, and shown extending transversely of and above the rod 18, said pinion lying in a socket 29, in said bracket 9. The shaft 28 is shown provided with a thumb-wheel 30, whereby the shaft can be turned. With this arrangement the cone 16 can be moved vertically as much as desired to cause the arms 19, to bear upon it sooner or later in accordance with the speed of the governor shaft 7. The arms 19, and the cone 16 thereby become a brake to retard the rotation of the shaft 7, which brake can be readily adjusted by hand to cause the shaft 7, to continuously rotate at the desired speed, for, by presenting a greater or less (or in other words, a wider or narrower) surface to the friction faces 19^a of the governor arms 19, the outward swinging of the weights 22 can be limited, and thus the force generated by their rotation will be applied through the arms 19, to the cone 16. By this means a very fine adjustment of the brake mechanism for the governor shaft can be effected, which will be found of special utility in a phonograph driven by a motor or mechanism of a gradually decreasing power, such as a spring actuated mechanism, as hereinafter described, although it is evident that this improved governing device may be used with a motor of a constant power, such as an electric motor as ordinarily applied for operating a phonograph.

My improved operating or driving mechanism is constructed and operated as follows:

31 is a going-barrel having a suitable spring within it and provided with a circular rack 32, which going-barrel may be of the ordinary or well known construction such as usually found in a musical box, so far as its general arrangement is concerned.

33 is the winding stem of the going-barrel, and 34 is a suitable key for winding the spring within said barrel.

The barrel 31 is shown located beneath the plate or table 2 and sustained by a bracket 35 carried thereby. To prevent reverse motion of said going-barrel, while at the same time preventing the noise that usually arises by the use of a ratchet and pawl, I have connected with said barrel 31, a friction disk 36, that is adapted to bear against rollers or balls 37 that are confined between said disk and an abutment 38. This abutment 38 is secured to the bracket 35 (see Fig. VII) and its side that faces said disk is cam like and gradually

approaches said disk forming a gradually decreasing or substantially V-shaped opening 39, in which the roller 37 may be jammed.

40 is a spring having one end 41 bent inwardly and lying in the path of the ball 37, so as to close the recess 39 and confine said ball in said recess while at the same time permitting said roller to have free movement in the direction of normal rotation of the disk 36 as shown by the arrow in Fig. VII.

With the above arrangement the disk 36 and the going-barrel 31 can have noiseless rotation in the driving direction, but if said disk tends to turn in the reverse direction the ball 37 will be jammed in the recess 39 between the disk 36 and abutment 38.

In Fig. VII I have shown two abutments 38, springs 40 and rollers 37, whereby the pressure on said disk 36 will be equalized.

The governor shaft 7 is to be driven from the going-barrel 31, and for this purpose I have provided a system of speed-gearing between said barrel and said shaft. The rack 32 is shown in mesh with a pinion 42 on an arbor 43, suitably journaled in the bracket 35. The arbor 43 carries the gear wheel 44, that meshes with a pinion 45 on an arbor 46, suitably journaled in the bracket 35, the arbor 46 at its upper end carrying a friction disk or wheel 47, that is arranged to bear on a friction pulley 48, carried by the governor shaft 7. The friction disk 47 preferably carries on its periphery a rubber or other friction band 49, and the pulley 48 may also be made of rubber to produce great frictional contact with a minimum of noise. By the system of gearing above specified in conjunction with the power of the spring in the going-barrel the desired speed of the governor shaft 7 can be produced.

As above specified the governor shaft 7, has lateral motion which is for the purpose of permitting the pulley 48 to be pressed with more or less force against the friction disk 47. I preferably press the parts 47 and 48 together by spring action and for this purpose I connect to the bracket 9 a suitable spring 50, which at its other end may be detachably connected to an eye 51, on the bracket 35 or elsewhere. The action of this spring 50 is to continuously press the parts 47 and 48 together, and on account of the shaft 7 being pivotally supported any wear between said parts 47 and 48, will be automatically taken up.

To arrest the rotation of the governor shaft 7, when desired I have provided a brake which is arranged as follows:

52 is a handle or lever located above the plate 2 and carried by a shaft 53 suitably journaled in said plate and projecting below the same. At the lower part of said shaft is secured a spring finger 54, that is arranged to bear upon the pulley or roller 48, (see Fig. VI,) whereby the pressure of said finger upon said roller or pulley will stop the rotation of the governor shaft. To hold the lever 52 in the desired position it is provided on its

under side with a pin 55, arranged to enter apertures 56 in the plate 2, which apertures are so located as to hold the lever 52 in such position that the spring finger 54, will bear upon the roller or pulley 48 or release the same as the case may be.

57 is a knob on the lever 52 to permit its manipulation.

From the foregoing description it will be observed that I have provided a vertically arranged governor shaft that has lateral movement to permit frictional contact with its driving mechanism, and that said shaft is connected on one side to the operating mechanism, and on the other side to the cylinder of the phonograph, whereby said governor shaft is directly utilized for transmitting power to the phonograph cylinder. By this means I utilize the governor shaft as a means of connection in the line of transmission of power from the operating mechanism to the phonograph cylinder.

My improved governor will be found of great advantage in its capability of being adjusted to a nicety, so as to provide for uniformity of speed under all tensions of the operating spring or speed of the motor, and the consequent perfect delivery of the sounds from the phonograph cylinders.

A further improvement resides in the elimination of sounds from the driving mechanism by reason of the frictional transmission of power to the phonograph cylinders.

The device is simple in construction, readily manipulated and not liable to get out of order, as the parts co-act in such manner as to give the best results under all conditions.

Having now described my invention, what I claim is—

1. In a phonograph, a cylinder carrying shaft having a pulley, combined with an independent governor shaft having a pulley, guide pulleys and a belt passing from the governor shaft pulley over the guide pulleys and over the pulley on the cylinder shaft, substantially as described.

2. In a phonograph, a cylinder-carrying shaft, and a pulley thereon, combined with an independent governor shaft, a belt running therefrom over guide pulleys direct to said pulley, and means for rotating said governor shaft to transmit motion direct to said cylinder shaft, substantially as described.

3. In a phonograph, a cylinder-carrying shaft having a pulley combined with a governor-shaft, also having a pulley, a direct belt passing from said governor-shaft pulley to said cylinder-carrying shaft pulley, over guide pulleys, and driving mechanism connected with said governor shaft by frictional devices, substantially as described.

4. In a phonograph, a cylinder-carrying shaft, combined with a governor-shaft, and direct connections between said shafts, a spring-actuated mechanism for rotating said governor shaft, and frictional devices be-

tween said spring-mechanism and said governor shaft, substantially as described.

5. In a phonograph, a cylinder-carrying shaft, combined with a governor shaft connected therewith, said governor-shaft having lateral motion, and with driving mechanism having frictional devices for connection with said governor shaft, and means for holding said shaft against said devices, as and for the purposes specified.

6. A governor shaft, and weighted arms carried thereby and having friction faces, combined with a vertically adjustable brake device in line with said shaft, but independent thereof, and means for adjusting said brake-device toward and from said arms, to permit said friction faces to bear thereon with more or less force, substantially as described.

7. A governor shaft, and weighted arms carried thereby, said arms having friction faces, combined with a cone in line with said shaft, and means for adjusting said cone toward and from said arms as and for the purposes specified.

8. A governor and bell crank arms pivotally carried thereby, and weights connected with one member of said arms, the opposite members of said arms having friction faces, combined with a cone in line with said shaft, and means for adjusting said cone toward and from said arms, substantially as described.

9. A governor shaft, weighted arms pivotally carried thereby, and springs connecting said arms with said shaft, combined with a cone in line with said shaft and means for adjusting said cone toward and from said shaft, substantially as described.

10. A governor shaft, and weighted arms carried thereby, combined with a cone in line with said arms, a rack connected with said cone, a pinion in mesh with said rack, and means for turning said pinion to operate said cone, substantially as described.

11. The combination of a bracket or frame, a governor shaft pivotally carried thereby, a rod carried by said bracket or frame against which one end of said shaft bears, weighted arms pivoted on said shaft, a cone sliding on said rod and means for adjusting said cone toward and from said arms as and for the purposes specified.

12. The combination of a bracket and means for pivotally supporting it with a governor shaft carried thereby, governing devices connected with said shaft, a friction disk for turning said shaft and means for holding said shaft against said disk, substantially as described.

13. The combination of a plate or table and a standard carried thereby, with a vertical bracket or frame pivotally carried by said standard, a governor shaft journaled in said bracket or frame, governing devices connected with said shaft, a frictional driving disk to turn said shaft, and means for holding said shaft in engagement with said disk, substantially as described.

14. The combination of a vertical governor shaft, and means for permitting it to have lateral motion, governing devices connected with said shaft and a friction disk or roller on said shaft, with a friction disk and means for turning it, and with a spring arranged to press said disk and roller together, as and for the purpose specified.

15. The combination of a governor shaft, and governing devices connected therewith, with frictional devices for turning said shaft, and a brake to act on said shaft to arrest its rotation, substantially as described.

16. The combination of a governor shaft, governing devices connected therewith, frictional devices for turning said shaft, a brake finger to arrest the rotation of said shaft and a lever or handle carrying said brake finger, substantially as described.

17. The combination of a governor shaft, a friction disk or roller carried thereby, a friction disk in engagement therewith, a spring and intermediate devices between said spring and said friction disk for turning the latter by the former, as and for the purposes specified.

18. The combination of a laterally movable governor shaft, a friction disk arranged to turn said shaft, a going-barrel, a spring for turning said barrel, a rack carried by said barrel, and gearing between said rack and said friction disk, as and for the purposes specified.

JOSEPH BROICH.

Witnesses:

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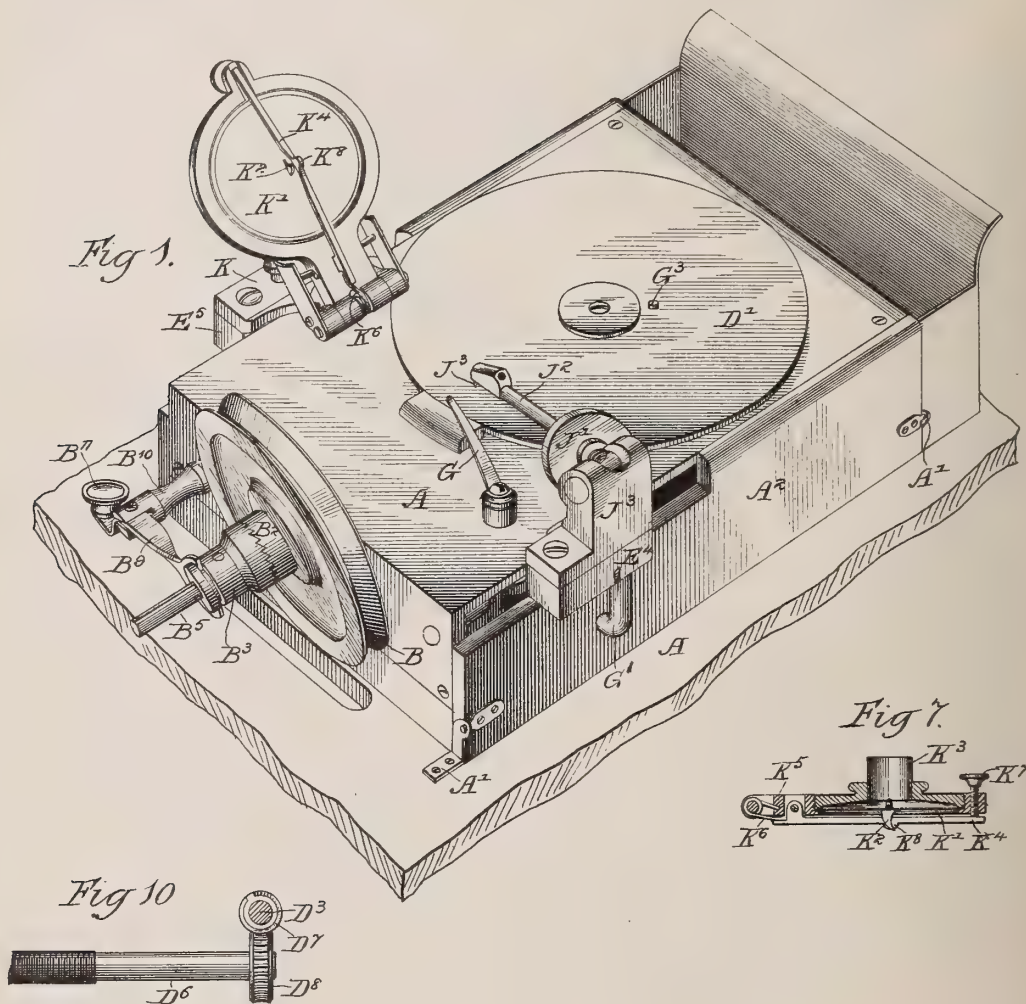
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3 Sheets—Sheet 1.

J. E. WASSENICH.
DISK GRAPHOPHONE.

No. 532,851.

Patented Jan. 22, 1895.



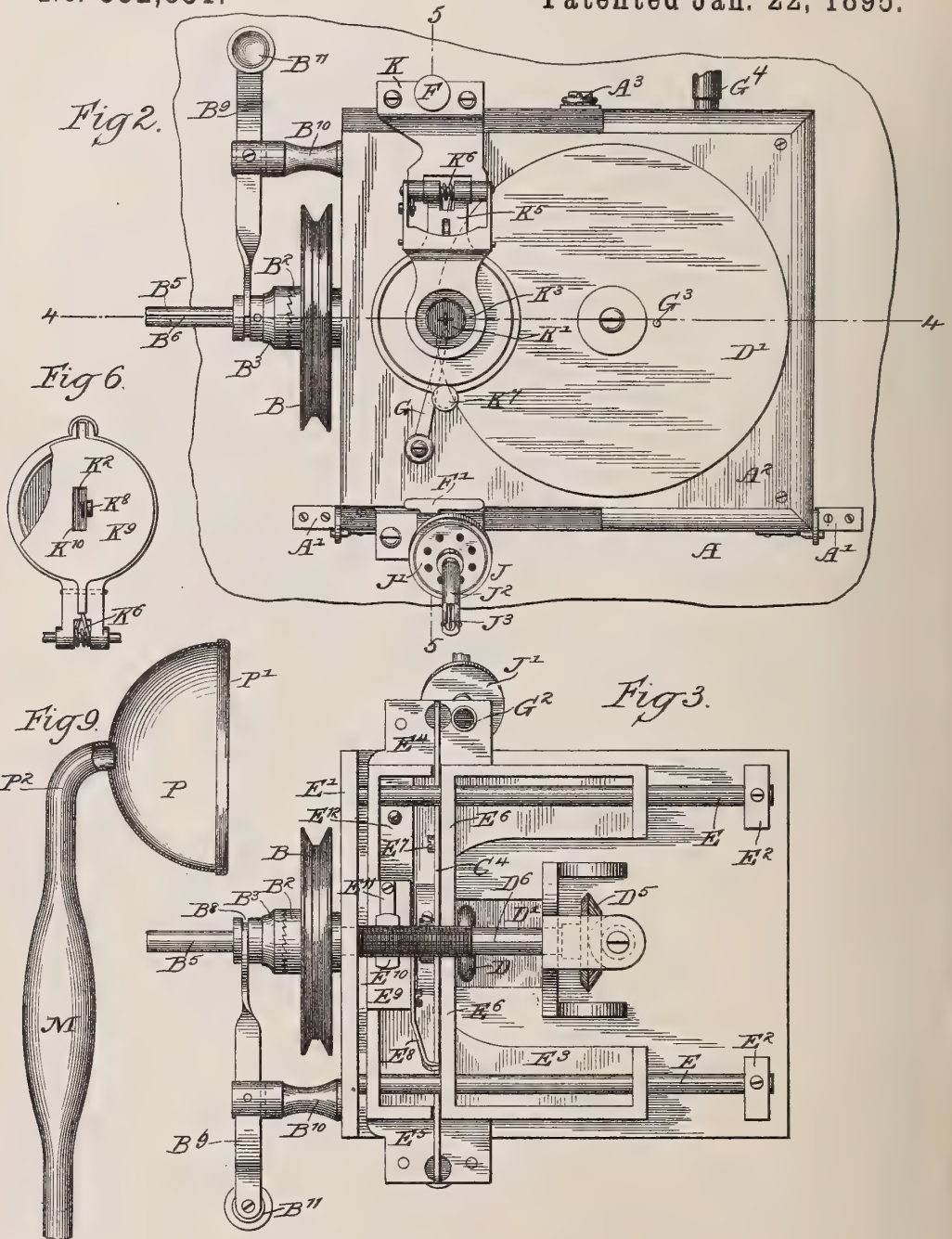
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DISK GRAPHOPHONE.

No. 532,851.

Patented Jan. 22, 1895.



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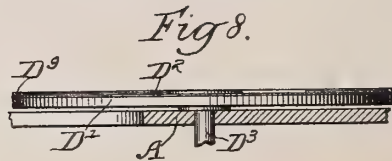
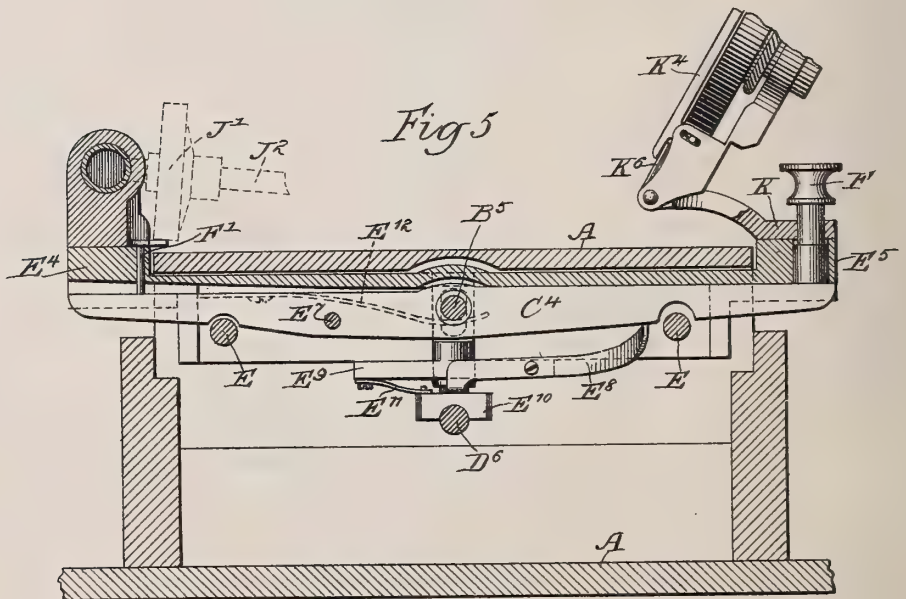
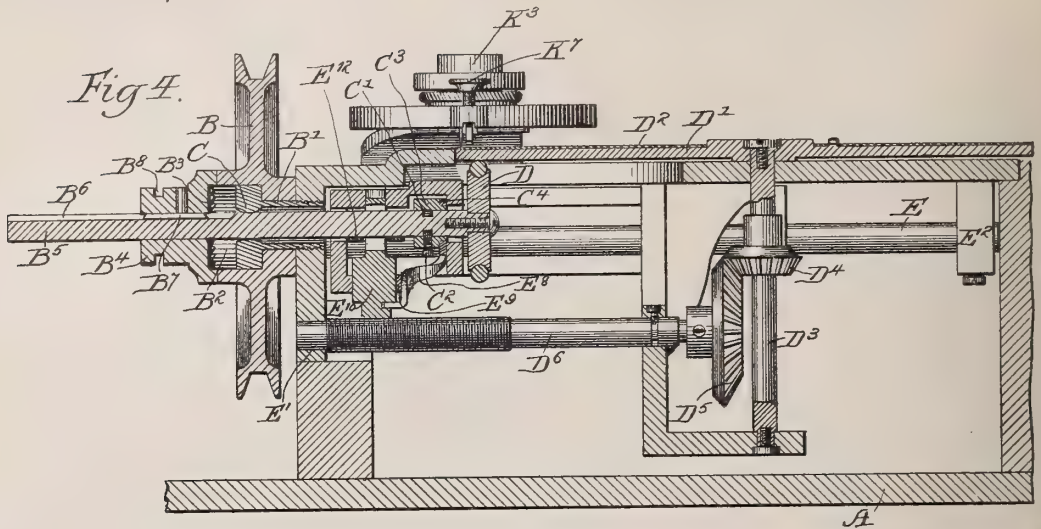
(No Model.)

3 Sheets—Sheet 3.

J. E. WASSENICH.
DISK GRAPHOPHONE.

No. 532,851.

Patented Jan. 22, 1895.



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UNITED STATES PATENT OFFICE.

JOSEPH E. WASSENICH, OF CHICAGO, ILLINOIS.

DISK GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 532,851, dated January 22, 1895.

Application filed May 12, 1892. Serial No. 432,806. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. WASSENICH, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented a new and useful Improved Disk Graphophone, of which the following is a specification.

My invention relates to improvements in sound recording and reproducing instruments, and especially such as are known as graphophones, and has for its object to provide a simple, easily constructed, easily operated, commercial machine. It is illustrated in the accompanying drawings, wherein—

Figure 1 is a perspective view of my machine. Fig. 2 is a plan view thereof. Fig. 3 is a view looking up from the bottom. Fig. 4 is a cross section on the line 4—4 with certain parts shown in full line. Fig. 5 is a cross section on the line 5—5. Figs. 6 and 7 are details of the recorder showing modifications for adjusting. Fig. 8 is a clamp ring associated with the tablet holder. Fig. 9 is a form of ear piece. Fig. 10 is a modification of the gearing for moving the threaded bar.

Like parts are indicated by the same letter in all the figures.

A is the table from which rise the two standards A' A' on which the machine case A² is pivoted, so as to be hinged as it were upon the table.

A³ is a catch whereby the box or case is secured in position. B is a driving pulley journaled on the sleeve or hollow bearing B' which is secured at one end of the case.

B² is one face of a clutch mechanism formed upon the pulley and opposed to a similar face B³ on the sliding sleeve B⁴ on the driving shaft B⁵. This shaft has a groove B⁶, in which a feather B⁷ on the sleeve B⁴ is placed so that sleeve and shaft rotate together. The sleeve is grooved at B⁸ to receive the ends of a lever B⁹, which is pivoted on the thick standard B¹⁰ and is provided with the finger piece B¹¹, whereby the sleeve may be moved back and forth on the shaft to throw the clutch mechanism into or out of operation. The shaft B⁵ is journaled in the rounded or knife edge bearing C, and at its inner extremity is provided with a groove C', into which a screw C² in the block C³ projects. This block is secured upon

the lever C⁴, and it serves as the inner journal for the shaft. At the inner extremity of the shaft is secured the preferably elastically tired friction wheel D, which under operating conditions bears upwardly and operatively against the lower face of the tablet holder D', which carries the tablet D² and is secured upon the upper extremity of the rotating shaft D³. This shaft, as shown in Figs. 3 and 5, is provided with the beveled gear D⁴, which meshes with the beveled gear D⁵ on the end of the threaded bar D⁶, which latter bar is adapted to drive the carriage which supports the recording and receiving devices.

In Fig. 10 the shaft D³ is provided with a screw thread D⁷ to engage the worm gear D⁸. These are suggested modifications which might be found desirable for certain purposes.

In Fig. 8 I have shown a clamping ring D⁹, adapted to rest upon and about the tablet holder so as to clamp the tablet at its outer edge.

E E are rods across and within the case and fixed in position in the end piece E' and the blocks E² E². On them is disposed the carriage E³, which carries the receiver, the recorder, the tablet driving mechanism, and the shaft. This carriage has at one side the laterally projecting part E⁴, which carries the receiver or more properly speaking the re-producer, and on the opposite side the laterally projecting part E⁵ which carries the recorder.

E⁶ is a cross bar on the carriage to which the bar C⁴ is pivoted at E⁷.

E⁸ is a lever pivoted on the fixed part E⁹ of the carriage and projected at one end into the path of the pivoted bar or lever C⁴ and at the other in engagement with the vertically movable screw threaded block E¹⁰. This block is held against and in engagement with the threaded bar D⁶ by means of the spring E¹¹.

E¹² is a flat spring on the carriage and bearing upwardly on the shaft B⁵ so as to keep its friction wheel normally in contact with the tablet holder.

At one end of the pivoted bar or lever C⁴ is the thumb piece F, which by being depressed will lower the bar C⁴ and thus lower the friction wheel and bring it out of engagement

with the tablet holder. The same motion rocks the lever E⁸ and causes it to lift the screw threaded block E¹⁰ away from the threaded bar. The opposite end of the bar C⁴ will rise and move the pin F' upwardly, and since the latter is in engagement with the reproducer, the reproducer will be lifted from the tablet. Under these conditions, the whole of the operating mechanism will be out of gear or out of operative connection with the driving pulley, and the parts may be moved at will to any point. When the thumb piece F is released the several springs will restore the parts to their original position.

G is a spring adjustably secured to the top of the case and adapted to rest on the outer edge of the tablet near the point where the work is going on.

G' is a metal tube extending from the aperture G² in the support for the reproducer whence should lead a rubber tube to the socket G⁴ on the working side of the machine. The tablet may be held in position by means of the pin G³.

The reproducer J I do not describe in detail but it consists substantially of a diaphragm body J', which rests upon the pin F', a tube J² and a pin J³ with a connection from the pin to the diaphragm. It is pivoted upon the block J³ and from the tube and diaphragm holder a passage leads to the block J³ and the support E⁴ to the aperture G², whence leads the tube G'. The recorder is pivoted upon the block K which is at rest upon the support E⁵. This recorder consists of a diaphragm K', with the cutting point K² in the midst thereof, and the nipple K³ at the back of the diaphragm chamber.

K⁴ is a pivoted bar carried on the surrounding case or rim K⁵ of the recorder and is provided with a rounded bearing lug at its center in proximity to the cutting point, an upwardly forcing spring K⁶ at one end and an adjusting set screw at the other. The bearing lug is lettered K⁸. By this device the depth of the cut may be varied at will.

In Fig. 6 I have shown a modification wherein the bar is replaced by a plate K⁹, carrying the bearing lug K⁸ and an aperture K¹⁰ through which the cutting point K² projects.

I show in Fig. 9 a modified form of ear piece to be substituted for the ordinary ear pieces. It consists of the bell shaped portion P preferably provided with the rim cushion P' of elastic material, and the curved tube P². It is obvious that many of these features or details shown might be greatly modified without departing from the spirit of my invention, and I do not wish to be limited to the precise construction of details shown. Many of the subcombinations and portions could be dispensed with or others substituted for them without affecting materially the operation of the remaining features.

The use and operation of my invention is

as follows: Assuming that the parts are situated substantially as illustrated in Fig. 2, the process of recording may be begun by speaking into the tube which will be associated in the usual manner with the recorder. If it is desired at any time to stop or start the mechanism it is accomplished by laterally moving the lever B⁹ to engage or disengage the clutch mechanism. The driving pulley B is driven from any convenient motive power. As the operation of the machine continues, it will be seen by having reference to Figs. 3 and 4 that the tablet holder will be rotated against the cutting point, while at the same time the cutting point with its associated recorder mechanism and the driving shaft friction wheel and carriage will be moved toward the center of the tablet by means of the action of the screw threaded block E¹⁰ associated with the carriage in conjunction with the threaded bar D⁶. The smooth portion of the threaded bar D⁶ is of less diameter than the threaded portion as indicated, so that the motion of the carriage toward the center of the tablet is automatically arrested when it has proceeded to the predetermined limit of motion.

Referring now to Fig. 1, it will be observed that the parts are in position for reproduction of the sound, and the reproducing point is adapted to engage the spiral groove made in the tablet by the recorder. The tube G' and the tube connection G² will lead the sound to the ear piece through the connecting tube M. The operation with regard to the motion of the carriage is the same as before. If now, it be desired at any point in the process of reproduction, to arrest the machine and reset it at any point, it may conveniently be done by depressing the thumb piece F which by rocking the bar C⁴ on its pivot lifts the reproducer from the tablet by means of the pin F', and at the same time the motion of the bar C⁴ is communicated through the lever E⁸ to lift the block E¹⁰ from the threaded bar D⁶, thus putting all the parts out of operation and leaving the carriage free to be moved any distance in either direction on its supporting or guide bars. The depression of the bar C⁴ carries with it the inner end of the shaft B⁵, which therefore must have a rounded or knife edge journal, or the equivalent thereof for its other end. I have also shown the case or box as hinged so as to furnish easy access to the working parts. The tablet is held down flat on its holder by means of the spring G or by means of the ring clamp D⁹ as may be found preferable. The recorder itself bearing upon the hinged tablet keeps it closely down upon the holder. The tablet is kept from rotating in any desired manner, as for example by the pin G³ passing through a perforation in the tablet. The adjustment of the depth of cut made by the recorder is accomplished by operating the set screw K⁷. The ear piece bell shaped, with the elastically cushioned rim and the bent tube is ap-

plied to the exterior instead of the interior of the ear.

I claim—

1. In a sound recorder, or reproducer, the combination of a tablet holder with a tablet thereon, and a spring arm adapted to clamp the edge of the tablet in proximity to the point where the recorder proper is applied to such tablet, said holder and tablet being adapted one to move with reference to the other.

2. In a sound recorder or reproducer, the combination of a diaphragm with a cutting point thereon, with a bearing lug in proximity to such point, and a bar to carry such lug said bar pivoted and adjustably held by means of a counter-acting spring and set screw.

3. In a sound recording or reproducing device, the combination of a cutting point, with a bearing lug in proximity thereto, a part to hold such lug, and a counteracting spring and set screw associated with such part so as to make the position of the lug adjustable.

4. In a sound-recording machine, the combination of a disk-shaped tablet holder, a rigid casing or box-like support with sliding carriage sustained therein, said box-like support having openings on both sides, through which the ends of said carriage protrude, said ends carrying a recorder or reproducer.

5. In a sound recording or reproducing machine, the combination of a disk-shaped tablet or tablet-holder, supported so as to rotate about a fixed point, with a driving mechanism therefor immediately connected thereto, whose point of operative connection with the tablet or holder is movable along a line substantially radial with the tablet-holder, and a movable carriage to carry said driving mechanism and a recorder or reproducer, carried by such carriage.

6. In a sound recorder or reproducer, the combination of a disk-shaped tablet or tablet-holder supported so as to rotate about a fixed center, with a driving friction wheel immediately connected thereto whose point of operative connection with the disk or tablet holder is movable along the line radial to such disk or tablet holder, and a movable carriage to carry said driving friction wheel, and a recorder or reproducer carried by said carriage.

7. In a sound recorder or reproducer, the combination of a disk-shaped tablet holder or tablet with a driving friction wheel engaging such tablet holder or tablet and movable along a radial line thereof, and a movable carriage to carry said driving friction wheel, and a recorder or reproducer carried by said carriage.

8. In a sound recorder or reproducing machine, the combination of a disk-shaped tablet holder with a carriage moving parallel with the surface of such tablet holder, and a recorder or reproducer carried by such carriage, said tablet holder being in a plane between the carriage and the recorder or reproducer.

9. In a sound recording or reproducing machine, the combination of a disk-shaped tablet or tablet holder with a carriage moving parallel with a diameter of such tablet holder or disk and a recorder or reproducer carried by such carriage, said recorder or reproducer supported at one side of the carriage and disk, and driving mechanism for such disk supported on and traveling with the carriage.

10. In a sound recording or reproducing machine, the combination of a disk-shaped tablet or tablet holder with a carriage moving parallel to one diameter of such disk, a sound recorder or reproducer and a disk driving mechanism supported on and moving with such carriage.

11. In a sound recording or reproducing machine, the combination of a disk serving as a tablet holder or tablet, with driving mechanism, containing a friction wheel associated therewith, a sliding carriage, a hinged reproducer, and the controlling device connected with such driving mechanism and reproducer so as to simultaneously throw both out of operative connection with the disk without moving the carriage.

12. In a sound recording or reproducing machine, the combination of a disk serving as a tablet holder or tablet, with driving mechanism containing a friction wheel associated therewith, a hinged reproducer and the controlling device connected with such driving mechanism and reproducer so as to simultaneously throw both out of operative connection with the disk, and a carriage for such reproducer and driving mechanism, and a carriage moving device associated also with such controller so as at the same time to be thrown out of operation without moving the carriage.

13. In a sound recorder or reproducer, the combination of a disk serving as a tablet or tablet holder, with a driver containing a friction wheel therefor, a hinged reproducer therefor, a carriage supporting the driver and reproducer, a driving mechanism operatively associated with such carriage, and a controller connected with such driver, reproducer and driving mechanism, so as by one motion to simultaneously throw all of them out of operative connection without moving the carriage.

14. In a sound recording or reproducing machine, the combination of a disk, serving as a tablet holder or tablet, with a friction wheel to drive the same, a reproducer to engage the same, a carriage upon which the friction wheel and reproducer are supported, a driving mechanism consisting of a screw and block to move the carriage parallel with one diameter of the disk and a system of controlling levers adapted to simultaneously disengage the friction wheel and reproducer from the disk, and the block from the screw.

15. In a sound recording or reproducing machine, the combination of a recording or reproducing mechanism, with a suitable sup-

port therefor and means for driving such mechanism, consisting in part of a longitudinally movable operating shaft, with a driving pulley, journaled upon the part which serves as a bearing for such shaft, and means for operatively connecting the shaft and pulley at will.

16. In a sound recording or reproducing machine, the combination of a recording or reproducing mechanism, with a suitable support therefor and means for driving such mechanism, consisting in part of a longitudinally movable operating shaft, with a driving pulley journaled upon the part which serves as a bearing for such shaft, and means for operatively connecting the shaft and pulley at will, the same consisting of a sliding block feathered to the shaft and adapted to clutch the pulley.

17. In a sound recording or reproducing machine, the combination of a recording or reproducing mechanism, with a suitable support therefor, and means for driving such mechanism, consisting in part of a longitudinally movable operating shaft, with a driving pulley journaled upon the part which

serves as a bearing for such shaft, and means for operatively connecting the shaft and pulley at will, the same consisting of a sliding block feathered to the shaft and adapted to clutch the pulley, said shaft passing through a rounded or knife-edge bearing or journal.

18. In a sound recording or reproducing machine, the combination of a driving pulley on a fixed bearing, with an operating shaft passing through such bearing, means for connecting the shaft and pulley at will, such bearings so constructed as to permit said shaft to oscillate or be depressed at one end.

19. In a sound recording or reproducing machine, the combination of a disk serving as a tablet or tablet holder with a carriage to carry the operating parts, a friction wheel to drive the disk, a shaft on which such friction wheel is supported, and a bearing on the carriage for such shaft so constructed as to prevent a longitudinal movement of the shaft independent of the carriage.

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(No Model.)

4 Sheets—Sheet 1.

E. BERLINER.
GRAMOPHONE.

No. 534,543.

Patented Feb. 19, 1895.

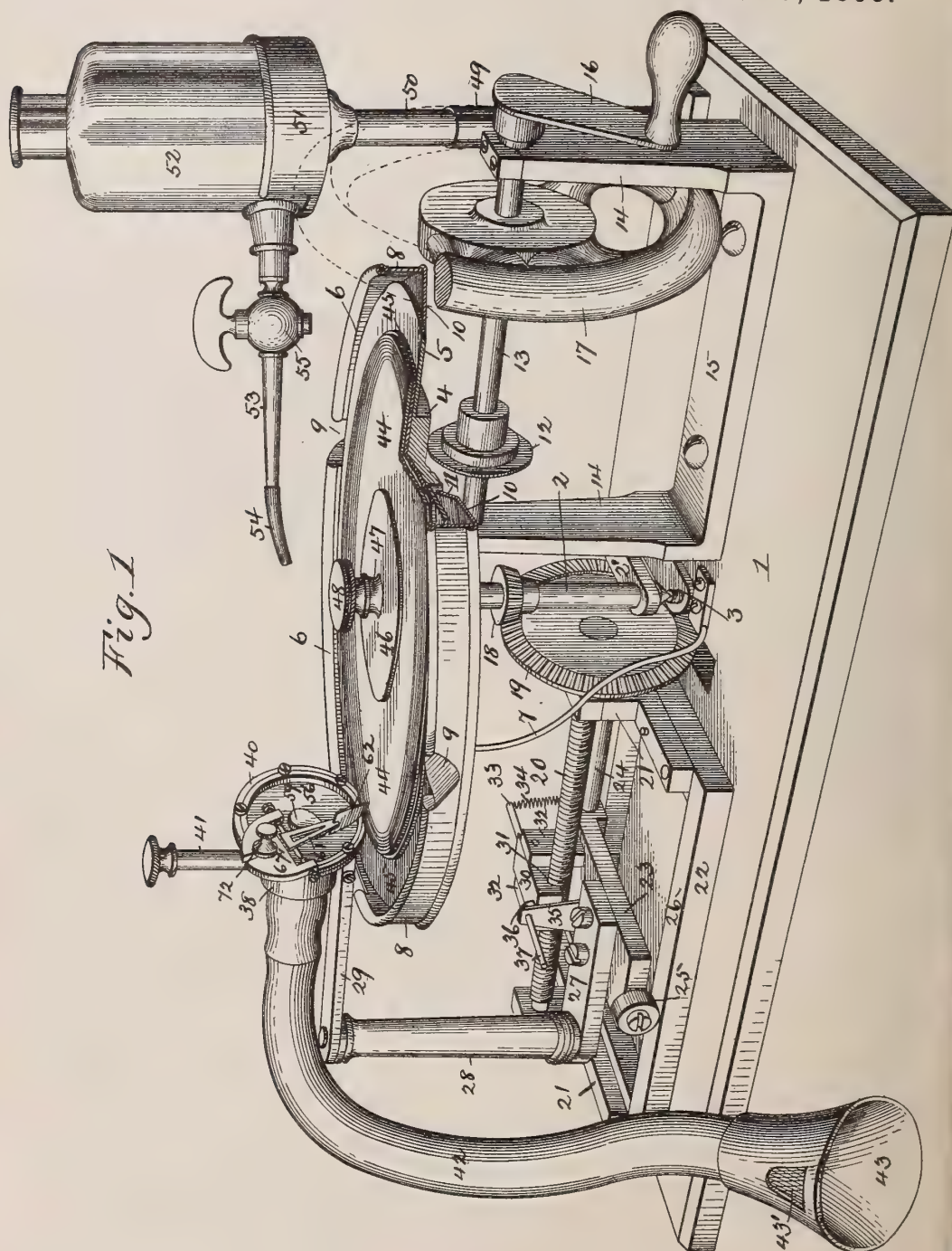


Fig. 1

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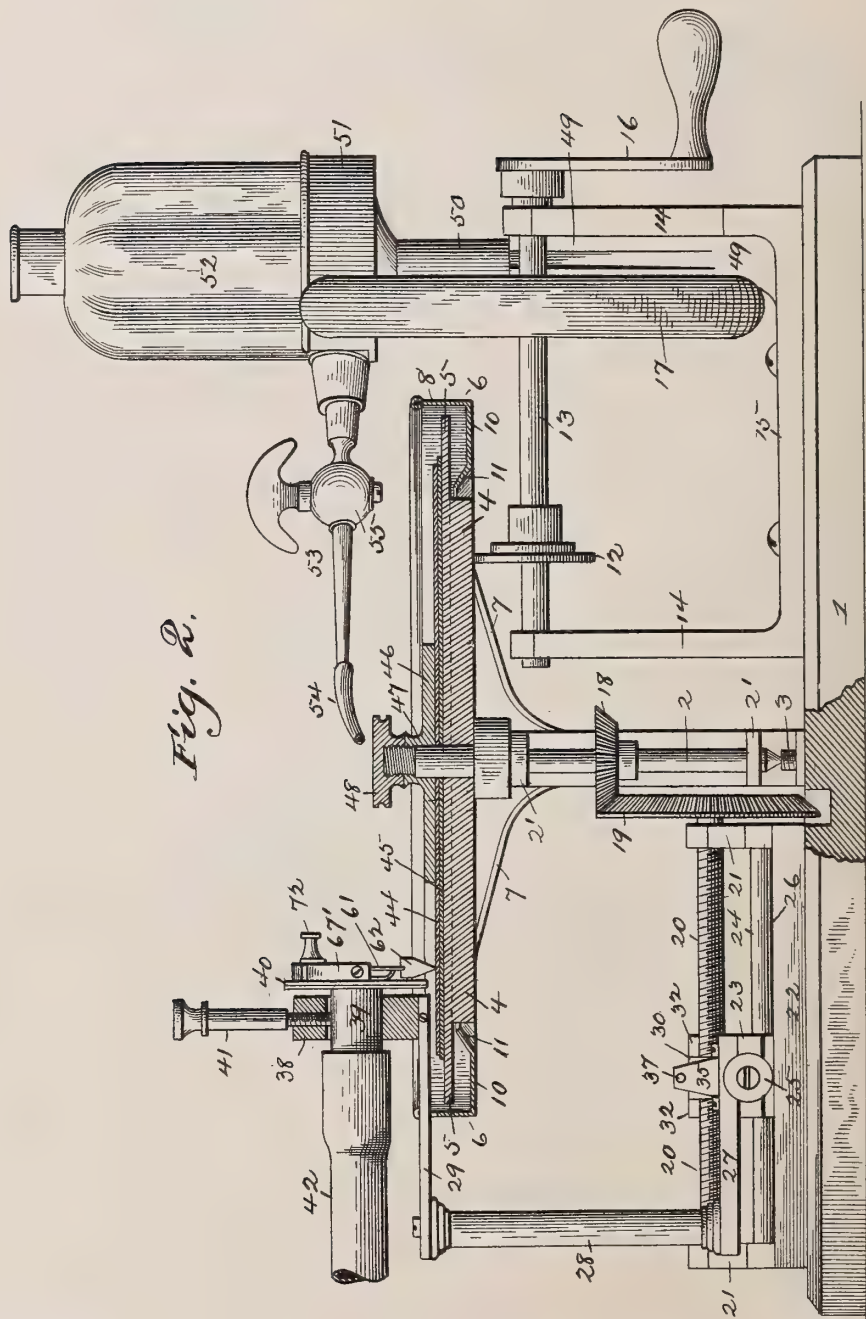
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GRAMOPHONE.

No. 534,543.

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Fig. 2.



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4 Sheets—Sheet 3.

E. BERLINER.
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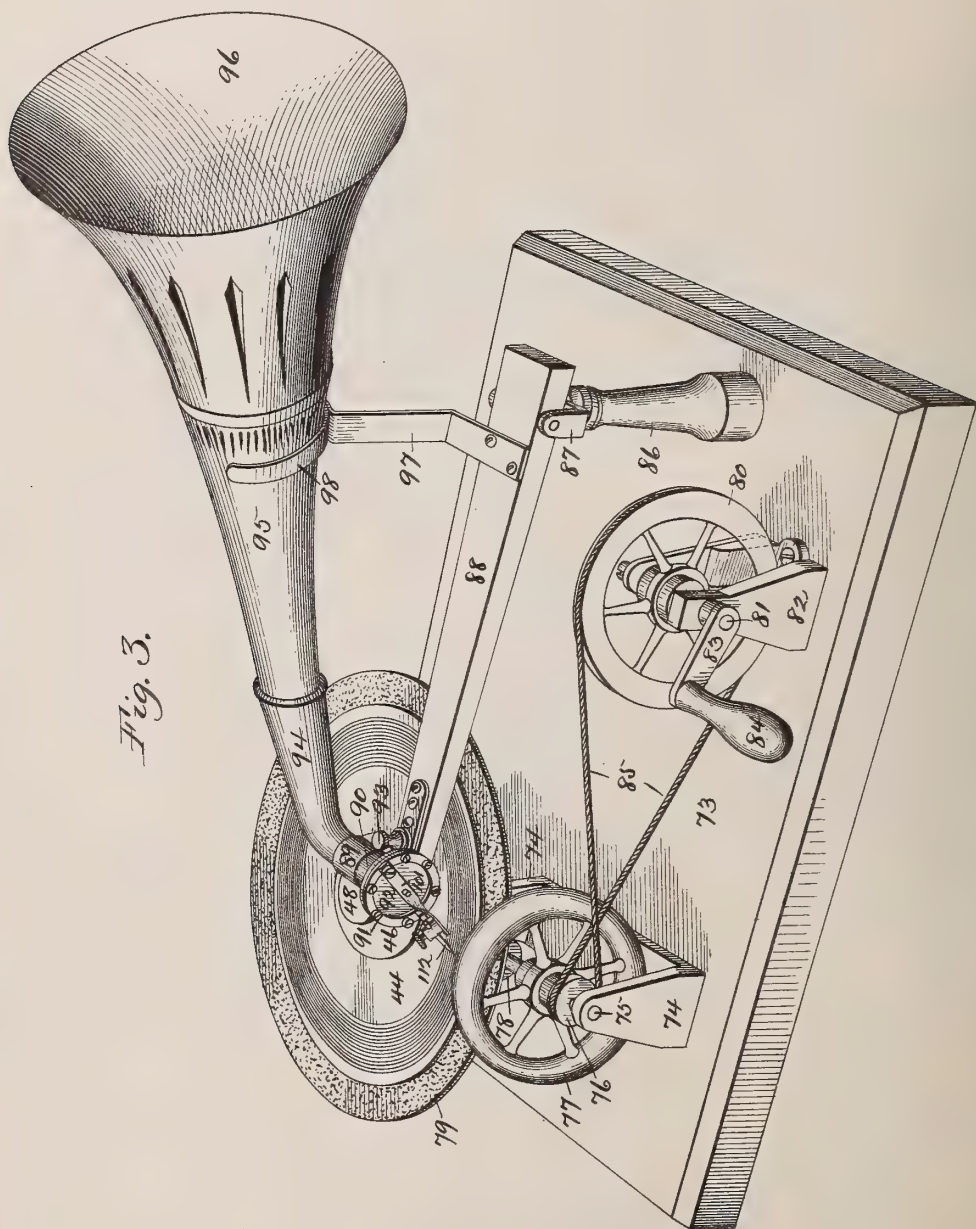


Fig. 3.

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GRAMOPHONE.

No. 534,543.

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Fig. 4.

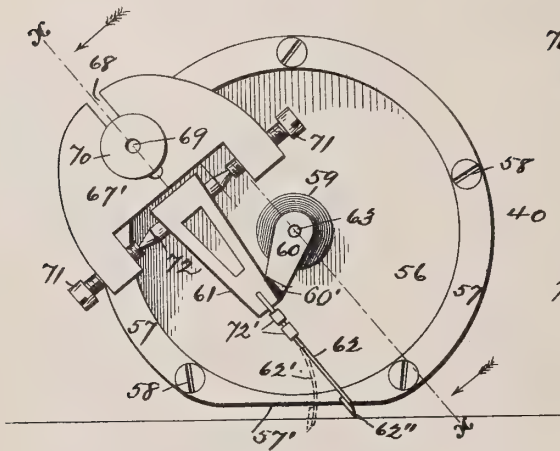


Fig. 5.

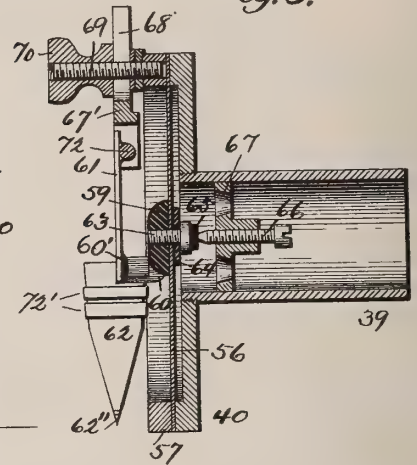


Fig. 6.

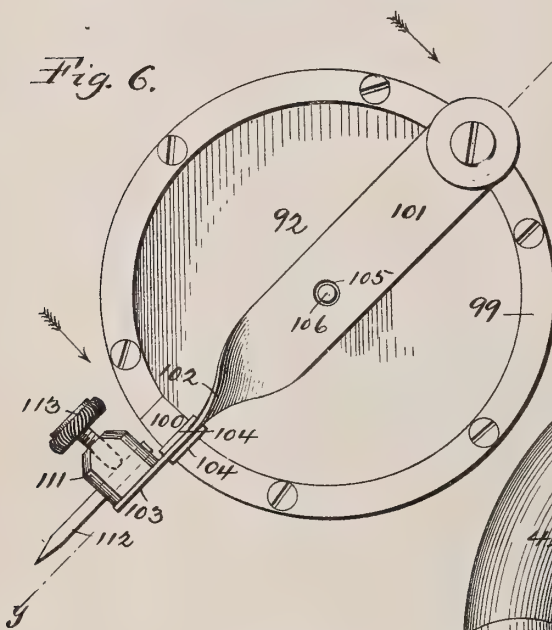


Fig. 7.

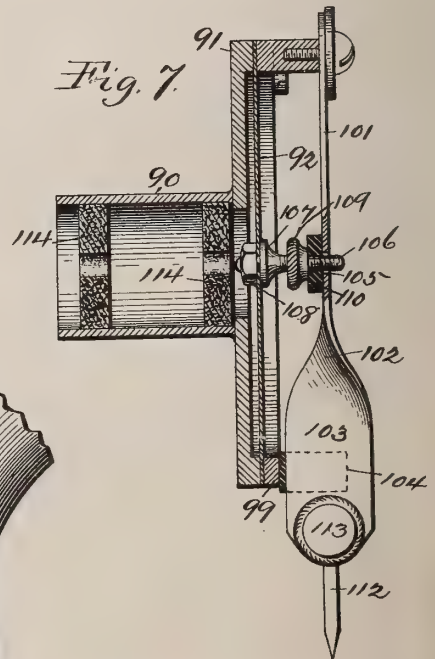
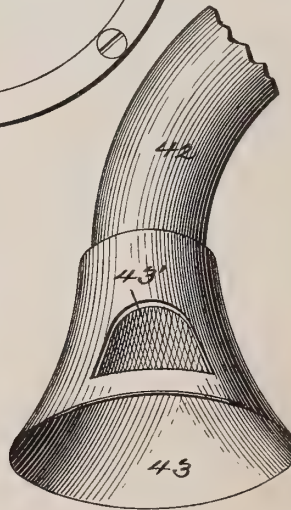


Fig. 8.



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UNITED STATES PATENT OFFICE.

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GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 534,543, dated February 19, 1895.

Application filed March 30, 1892. Serial No. 427,060. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, and a resident of Washington, District of Columbia, have invented certain new and useful Improvements in Gramophones, of which the following is a specification.

My invention has reference to improvements in the method of and apparatus for recording and reproducing sounds, the improvements being more particularly directed to the construction of that kind of sound recording and reproducing apparatus which I have called "gramophone," and for which Letters Patent of the United States No. 382,790, dated May 15, 1888, have been granted to me.

One feature of my invention has reference to improvements in the method of recording sound by tracing upon a fatty film deposited upon a metallic surface, undulatory lines, corresponding to sound waves, and then etching such lines in the metal base, or as it is now commonly called, the record tablet; while the other features of my invention have reference to the construction of the details of both the recorder and the reproducer of the gramophone. Each of these features of improvement are designed to overcome certain difficulties, and to avoid certain imperfections heretofore met with in the operation of the gramophone. These difficulties and imperfections, and the manner in which they are avoided, will be particularly pointed out in the following detailed description with reference to the accompanying drawings, in which—

Figure 1, is a perspective view of my improved gramophone recorder. Fig. 2 is a side elevation, partly in section, of the recorder. Fig. 3 is a perspective view of a gramophone reproducer. Fig. 4, is an elevation of a recording diaphragm and stylus. Fig. 5, is a section of the same on the line $x-x$ of Fig. 4. Fig. 6, is an elevation of the gramophone reproducing diaphragm and stylus. Fig. 7, is a section of the same on line $y-y$ of Fig. 6, and Fig. 8, is a perspective view of an improved mouth-piece for the recorder.

Like numerals of reference indicate like parts throughout the drawings.

My improved gramophone recorder is shown

as a whole in Figs. 1 and 2, mounted upon a suitable base 1. About midway of the length of this base there is an upright shaft 2, journaled in brackets 2', 2', stepped at its lower end in a suitable bearing 3. This shaft carries at its upper end a circular disk 4, the outer or peripheral portion of which is reduced in thickness as shown at 5, and this reduced portion extends over a ring shaped pan 6, supported by stays or brackets 7, from which it may be lifted and removed, when required. The outer edge or wall 8, of the pan is of sufficient height to project for a distance above the disk 4, and is provided with pouring lips 9, for a purpose hereinafter described. The bottom 10 of the pan extends under the reduced portion 5, of the disk 4, and its inner edge 11, is upturned close to the under side of the reduced portion of the disk, as shown.

Bearing against the under side of the disk 4, is a friction wheel 12, secured to a horizontal shaft 13, which latter is journaled in the upper ends of posts or uprights 14 constituting the ends of a frame, the base 15, of which is secured to the base 1 of the apparatus. The position of shaft 13, and the diameter of the friction wheel 12, are such, that a portion of the weight of the disk 4, and of its shaft 2, is supported by the friction wheel; whereby the bearing 3, is relieved from a portion of that weight, and whereby frictional gearing between the disk 4 and wheel 12 is insured, without requiring special adjustment. The shaft 13, carries at its outer end a crank 16, by means of which it is rotated, and between the two uprights 14, there is secured to the shaft a heavy fly or balance wheel 17. Secured to the upright shaft 2, below the disk 4, there is a beveled pinion 18, meshing with a large bevel gear 19, on one end of a horizontal screw-threaded shaft 20, which is arranged radial to the disk 4, and journaled adjacent to the said gear 19, and also at the other end, in pillow-blocks 21, supported on the end piece of a rectangular frame 22, which in turn is fast on the base 1. Mounted upon the frame 22, so as to be movable thereon in the direction of the length of the shaft 20, there is a carriage 23, supported at one end by a guide rod 24, on which it is free to slide, and at the other end by a roller 25, movable

along the upper surface 26, of one of the side pieces of the frame 22. The carriage 23, has firmly secured to it a projecting arm 27, on the outer end of which is an upright post 28, carrying at its upper end an arm 29, parallel with the arm 27, and of such length as to overhang the disk 4, when the carriage is moved to the right, as represented in the drawings; the construction being such, that when the carriage 23 is moved in the manner to be described, the arm 29, will be carried radially over the disk 4, and any object carried thereby will participate in said movement.

The carriage 23, is moved in one direction by means of the screw-threaded shaft 20, and in order to effect this operation, there is provided a block 30, in one side of which, near one end, is formed a half nut 31, constructed to engage the threads on the shaft 20; and this block 30, is pivotally supported between ears 32, erected on the carriage 23. Projecting from the other end of the block 30, there is a pin 33, to which one end of a spring 34, is attached, the other end of said spring being secured to the carriage 23, and the tendency of the spring is to maintain the block 30, in a tilted position with the nut portion raised out of engagement with the shaft 20. In order to lock the block 30, in engagement with the shaft 20 there is provided a leaf spring 35, mounted on the carriage 20, opposite the free end of the block 30, and having on its free end a tooth 36, which passes over the top of the hinged block 30, when the nut formed in the same is in engagement with the screw threads on the shaft 20, the tendency of the leaf spring 35, being to move inwardly toward the block 30. This catch spring 35, is also provided with a pin 37, which serves as a handle for withdrawing the catch so as to unlock the block 30, and thereby allow the carriage 23 with its appurtenances to be freely moved to any position upon the frame 22.

To the free overhanging arm 29, is secured a ring sleeve 38 which receives the neck 39, projecting on one side from the frame 40, in which latter the recording diaphragm and stylus are mounted, and this neck 39, with its appurtenances is fixed in any desired position in the ring frame 38, by a clamp screw 41. The free end of the neck 39, projects beyond the ring frame 38, and receives the sound conveying tube 42, which is preferably made flexible, and which has at its free end a mouth-piece 43, the particular construction of which will hereinafter be more fully described.

The disk 4, which is in the nature of a rotary table, has hereinbefore been described and is shown in the drawings as reduced in thickness on that portion of the periphery which overlaps the inner wall of the pan 6, and if this construction is used, the disk 4, must be removable from the shaft 2. It is, however, also practicable to make the disk or revolving table, in two parts, the lower part of which extending only to within a short dis-

tance of the upper edge of the inner wall 11, of the pan, while the upper part extends over that edge to within a short distance of the outer wall of the pan. This is indicated by a dotted line in Fig. 2, and if this construction is adopted, only the upper thinner part of the table is removable from the upright shaft 2, while the lower thicker part of the table may be fixed to that shaft.

When a sound record is to be made, a record tablet of the kind described in my aforesaid Letters Patent, is placed upon the rotary table 4, and this record tablet is represented in the drawings as a circular disk 44, which has a central perforation passing over the upper end of the shaft 2. Sometimes it is convenient to interpose between the record tablet and the rotary supporting table a thin disk 45, of felt, or of some other non-resonant material. This, however, is not essential. Upon the record tablet is placed a clamping plate 46, which by preference is provided with a hub 47, which is slipped over the upper end of the shaft 2. This upper end of the shaft 2, is screw-threaded as shown, and a thumb-nut 48, is then screwed down upon the hub of the clamping plate, whereby the record tablet is securely fastened in position.

At one end of the base plate 1, there is mounted a standard 49, which may be a split tube as shown, and in which is supported by friction a stem 50, projecting from the bottom of a shelf 51, and which in turn supports a vessel 52, containing alcohol. From the bottom of this vessel extends a tube 53, preferably provided at its free end with a flexible nozzle 54; and a stop-cock 55, with which the tube is provided permits the operator to regulate the flow of alcohol from the nozzle. With my present improvement it is necessary that during the whole process of tracing the record, the record tablet be covered with a film of alcohol, and for this purpose a thin stream of alcohol is directed upon the center of the tablet, or rather upon the clamping plate 46, from which the alcohol spreads in all directions by centrifugal force, and flows over into the pan 6. When the tracing of the record has been completed, the clamping plate is removed and the record tablet also is lifted from its support by the insertion between the same of a sharp edge, such as a knife blade, or even by the finger nails of the operator, and is removed for further manipulation as described in my aforesaid Letters Patent, and also for the manipulation which will be described hereinafter.

Only a very small quantity of alcohol is used for producing a single record, but after continued use of the machine a considerable amount of alcohol accumulates in the pan, and this is removed by removing the table 4, or the upper, thinner part thereof, as the case may be, by inserting a finger in each of the pouring lips 9, and thus lifting the disk or table 4, from the shaft 2. The pan is then removed from the bracket 7, and the alcohol

is poured out and preferably back into the vessel 52, by one of the pouring lips.

The recording diaphragm 56, is mounted in the circular frame 40, between a ledge formed on said frame and an annulus 57, screwed down upon the same by screws 58, as shown, or in any other suitable manner. On the rear side of that diaphragm there is applied a small block 59, of hard rubber from which extends radially an arm 60, which at its free end is turned up at right angles, outwardly and into contact with the lever 61, which carries the recording stylus 62.

The block 59, is fastened to the center of the diaphragm by a screw 63, passing through the diaphragm and through a washer 64, applied to the front side of the diaphragm. The head of this screw is faced with a disk 65, of soft rubber, and against the same bears the point of an adjusting screw 66, which is mounted in a perforated disk or spider 67, fixed in the neck 39.

The lever 61 is mounted on a plate 67', formed with a slot 68, through which a set screw 69, fixed in the annulus 57, passes. The plate 67', can thus be adjusted to various positions on the annulus, and is clamped in the adjusted position by a thumb-nut 70. One end of the plate 67' is bifurcated, and screws 71, 71, passing through the legs of the fork, are formed at their ends with bearings for the pivot points of the arbor 72, which is fixed to the lever 61. This lever, is made as light as practicable and as is consistent with rigidity, and the plate 67', together with the lever 61, which it carries, is so adjusted that the upturned end of the arm 60, bears upon the lever at the greatest practicable distance from the axis of the spindle 72, viz: at the free end of the lever. The connection between the lever and the upturned end of the arm 60 is made by a small quantity of pitch, 60', which acts as an efficient cement, and which is applied after the lever has been adjusted to its proper position. This mode of connecting the lever with the arm 60, and thereby with the diaphragm, I have found to be of great advantage for a variety of reasons, but more especially on account of the ease with which the connection is made, and unmade in case of repair, and on account of the damping effect it has upon the lever.

To the end of the lever 61, is secured the recording stylus 62, by soldering or otherwise, with its plane at right angles to the plane of the lever, as shown. The stylus is composed of a flat, and rather thin plate of spring steel, pointed at its free end, and provided with a tracing point 62'', of iridium. The broad portion of the stylus is damped by one or two bands 72', of soft rubber, which are simply slipped over the same.

By reference to Fig. 4, it will be seen that the lever 61, with the recording stylus 62 extend across the diaphragm upon a line which constitutes a chord but not a diameter of the circle of the diaphragm. They are, therefore,

eccentrically mounted with reference to the center of the diaphragm; but notwithstanding this eccentric location, the lever is rigidly connected with the center of the diaphragm and thus receives the maximum amplitude of its vibration. By thus placing the lever with the stylus eccentric with reference to the center of the diaphragm both the lever and the stylus may be and are made shorter than if they were located on the line of a diameter of the diaphragm. This is an important result, since the shorter the lever and stylus, the less liability there is of lost motion, and the less liability there is of extra or spontaneous vibrations of the lever and stylus, and both of these facts conspire to produce an accurate tracing of the sound waves impinging against the diaphragm.

Where the stylus passes over the edge of casing 40, the latter, together with the annulus 57, is cut away upon a straight line, as indicated at 57'. This permits a further reduction of the length of the stylus, since the record tablet may be located close to the straight edge 57'.

The body of the stylus is normally curved downwardly, as shown in dotted lines at 62', but when the diaphragm holder or frame 40, is turned to cause the stylus to impinge upon the record tablet, which is the preparatory step for making a record, the stylus is unbent and becomes straight, as shown in solid lines in Fig. 4, and I have found that the best results are obtained when the stylus is at an angle of about forty-five degrees with the plane of the tablet. The maximum pressure of the stylus upon the record surface is therefore equal to the force required to unbend the stylus. It is very small, because the stylus is made as thin as practicable, and it is uniform for different records and for all parts of the same record.

The mouth-piece, into which vocal sounds are uttered for recording, is shown at 43, in Figs. 1 and 8, and it consists of a bell shaped structure, the small end of which is secured to the sound conveying tube, while the wide, flaring end is turned toward the speaker who applies his mouth to the opening. Near the edge of the mouth opening there is a perforation 43', cut into the wall of the mouth-piece, and this perforation is of such shape and size, and at such distance from the edge of the mouth-piece, as to fit approximately the edge of the nose of the speaker; so that when the mouth-piece is applied, the sounds uttered by the mouth enter the wide, flaring opening, while the sounds uttered by the nose enter the perforation 43'.

In making a record of vocal sounds, it is necessary that all sound waves composing the words or the song be conveyed to the diaphragm, and it has, therefore, been proposed to make mouth-pieces of such size and shape as to admit within the opening both the mouth and the nose of the speaker or singer, and to fit against the face of the user around the

mouth and nose. Mouth pieces of this character are necessarily large and clumsy, and do not readily and comfortably fit different persons, while with my construction the size of the mouth-piece is reduced, and will comfortably fit different speakers.

By means of the apparatus so far described, a record of sound waves is made in the following manner: The spring catch 35, 36, is drawn back, which permits the spring 34, to lift the block 30, from the screw 20, so that the carriage 23, may be freely moved to the left, whereby the stylus 62, is carried beyond the edge of the rotary table 4. A record tablet prepared in the manner described in my aforesaid Letters Patent is then placed upon the table 4, and clamped to the same, as hereinbefore described, and the carriage 23, is moved toward the right until the point of the recording stylus is above the tablet but within the edge of the same. The casing 40, is then turned in its bearing 38, until the point of the stylus impinges upon the tablet and is unbent, as shown in Fig. 4. In this position the casing 40, is clamped by means of the screw 41. The stop-cock 55, is then opened and a thin stream of alcohol is directed upon the clamping disk 46. The wheel 17, is now rotated by means of the crank and handle 16, whereby, by means of the gearing described, the record tablet is rotated, while the stylus is carried across the face of the tablet in a radial line, removing from the tablet a fine spiral line of the fatty etching ground with which it had been covered. Sound waves are now directed against the diaphragm in any desired manner, and if vocal sounds are to be recorded, the sound conveying tube 42, with the mouth piece 43, will be used. The vibrations of the diaphragm thus produced will cause the stylus to make a tracing of an undulatory line, corresponding to the sound waves directed against the diaphragm; all as described in my aforesaid Letters Patent. During this whole time a thin stream of alcohol is delivered upon the plate 46, and the alcohol spreading out in all directions is maintained as a uniform and constantly renewed film upon the tablet. In this manner every part of the record is made under alcohol, and in this respect my present invention differs from the process set forth in my aforesaid Letters Patent.

In accordance with the said patent, alcohol is poured once for all over the tablet, and is allowed to evaporate during the process of recording. I have found that in this manner it often happens that the alcohol has entirely evaporated before the record is completed, so that a portion of the latter is made upon a dry tablet; whereby the accumulation of filamentary particles of dust on the point of the stylus, which the alcohol is designed to avoid, takes place during the production of a portion of the record. With my present improvement this defect is cured, since it maintains the record tablet moist with alcohol from the beginning to the end of the operation.

After the tracing of the record has been completed, the tablet is speedily removed and before the record is fixed by etching as described in my aforesaid patent, the alcohol adhering to the record surface is quickly washed off with water. This is an important step in my improved process and greatly improves the definition of the record by etching. The reason for this is, that the alcohol slightly attacks and dissolves the fatty etching ground, so that the thin film of alcohol remaining upon the tablet, contains a slight quantity of that ground in solution. If now, the film of alcohol is allowed to evaporate an exceedingly small quantity of the dissolved ground is deposited upon the metal which has been laid bare by the stylus. This small deposit of ground sufficiently resists the action of the etching fluid to impair the definition of the final record. By simply pouring water over the record surface immediately after the tablet has been removed from the recording apparatus the film of alcohol and the ground held in solution by the same is removed, and the tracings of the stylus present a clean metallic surface, which is properly attacked by the etching fluid.

The reproducing apparatus as a whole is represented in Fig. 3.

Upon a base board 73, in standards 74, is journaled a shaft 75, upon which are mounted a driven pulley 76, a fly-wheel 77, and a friction disk 78. The latter is in frictional engagement with a rotary table 79, which is mounted upon a vertical shaft substantially in the manner described with reference to the rotary table 4, of the recording apparatus. Fig. 3, being a perspective view, the mounting of the table 79, is not visible, but is easily understood from the foregoing description. The upper surface of the table is preferably covered with a sheet of felt or other elastic and non-resonant material, as indicated by appropriate shading.

Upon the felt covered table 79, the record tablet 44, is placed and is clamped thereon substantially in the manner in which this is done in the transmitting apparatus, *i. e.*, by means of a clamping plate 46, and a thumb-nut 48. A driving wheel 80, mounted on a shaft 81, which is journaled in standards 82, is rotated by means of a crank 83, and handle 84, and gives motion to the table 79, by means of a crossed belt or cord 85. The relation of the table 79, to the friction disk 78, is the same as the relation of the table 4, to the friction disk 12; that is to say, the table rests with the greater part of its weight upon the friction disk, so that the frictional gearing is automatically maintained. A post 86, mounted upon the base-board 73, has swiveled upon its upper end a fork 87, between the prongs of which is pivoted the swinging arm 88, which extends over the table 79, and has at its free end a clasp 89, which receives the neck 90, which projects from the center on one side of the casing 91, of the reproducing

diaphragm 92. This casing with its diaphragm, stylus and appurtenances, which will presently be described, can be thus turned in the clasp, and can be fixed in any adjusted position by a clamp screw 93.

Upon the end of the neck 90, which projects beyond the clasp 89, is slipped a flexible tube 94, which in turn receives the small end of a sound conveying trumpet 95, the flaring end 96 of which is turned toward the listener. A bracket 97, secured to the swinging arm 88, carries at its free end an elastic fork 98, which receives and supports the trumpet, and the parts are so proportioned that the free end of the swinging arm preponderates, so that the point of the reproducing stylus, which will presently be described, presses rather firmly upon the record tablet.

It will now be understood, that when a record tablet, having a record of sound waves upon its surface, produced in accordance with my invention, is mounted upon the table 79, and when the point of the stylus is adjusted in engagement with the record groove, and the wheel 80, is rotated, the rotating record groove will guide the stylus across the face of the tablet, and will at the same time vibrate the stylus and diaphragm in accordance with the undulations of the record groove. The sound waves thus produced by the diaphragm will issue from the flaring opening of the trumpet, and the sounds will be heard by a listener in front of the trumpet, or in its vicinity.

The reproducing diaphragm is mounted in the casing 91, in the usual manner, being held against a ledge by means of an annulus 99. On this annulus is formed a swelling or block 100, and diametrically opposite to the same the stylus carrying spring 101, is fastened to the annulus, and extends across the face of the diaphragm and beyond the edge of the annulus. This spring 101, is a leaf spring which faces with its flat side the face of the diaphragm up to a point beyond the center of the latter, and is then twisted at right angles, as indicated at 102, and crosses the annulus edgewise as shown at 103. The tendency of the part 101, of the spring is to press toward the diaphragm, whereby the edge of the part 103, is made to bear with some force upon the annulus 99; and the tendency of the part 103, is to press against the swelling or block 100. The spring is therefore elastic in two directions at right angles to each other.

In order to prevent grinding of the spring against the annulus and against the block 100, a U-shaped piece 104, of soft rubber embraces the outer portion 103, where it bears upon the annulus and against the block. This soft rubber cushion also serves as a dampener for the spring. At the point where the spring passes over the center of the diaphragm, it has a perforation 105, and a screw pin 106, secured to the center of the diaphragm by two nuts 107, 108, extends loosely through the perforation. A thumb-nut 109, also placed on the screw-pin 108, and a soft rubber washer

110 between the thumb-nut and the spring serve to regulate the tension of the latter and of the diaphragm, as will be readily understood.

On the free end of the spring 101, 103, there is secured a binding post 111, in which the stylus 112, is held by the set screw 113, and may be adjusted to project to the required distance beyond the end of the spring. This stylus is preferably made of hard steel. It has a slender point, but the point should not be so sharp as to cut the bottom of the record groove which it engages.

In the operation of reproducing the sounds recorded on a tablet, the stylus is guided by the walls of the record groove, and not by the bottom of the same. Consequently it is not essential that the point of the stylus be in contact with the bottom of the groove. In fact it is preferably not in contact with the same, so that this point may be made rather dull.

The sounds emitted by the reproducing diaphragm are very powerful and ordinarily too loud to be received with comfort by a listener in front of the trumpet or other receiving tube. For this reason I have found it sometimes necessary to reduce the volume of the emitted sound before it reaches the ear, and this I accomplish by one or more perforated and exchangeable diaphragms 114, placed in the neck 90. These diaphragms should be made of some non-resonant material like soft rubber, or cork, as indicated by appropriate shading.

Having now fully described my invention, I claim and desire to secure by Letters Patent—

1. The method of recording vocal and other sounds which consists in removing from a record tablet covered with a fatty film, undulatory lines of said film by, and in accordance with the sound waves and maintaining at the same time a layer of a fluid over the film, substantially as described.

2. The method of recording vocal and other sounds upon a rotating disk covered with a fatty film which consists in spreading over said film and continuously renewing over the same a layer of a fluid and at the same time removing from said tablet undulatory lines of the fatty film by and in accordance with the sound waves, substantially as described.

3. The improvement in the art of making a gramophone record which consists in immersing and maintaining the tablet and the point of the recording stylus in alcohol during the process of recording, substantially as described.

4. The improvement in the art of making and fixing a gramophone record which consists in removing from a tablet covered with a fatty film undulatory lines of said film by and in accordance with sound waves while said film is covered with a layer of alcohol; then immediately removing the alcohol with water and then subjecting the tablet to the

action of an etching fluid, substantially as described.

5 The method of reproducing sounds from a record of the same which consists in vibrating a stylus and propelling the same along the record by and in accordance with the said record, substantially as described.

6. In a gramophone, a recording stylus pressing by its own elasticity upon the record tablet at right angles to the plane of its vibratory movements and consisting of a leaf spring terminating in a point of harder material than that of the body of the stylus, substantially as described.

7. In a gramophone, the combination of a sound receiving diaphragm and an elastic recording stylus controlled by the diaphragm and adjustable with reference to a record tablet so as to press by its own elasticity upon the same at right angles to the plane of its vibratory movements, substantially as described.

8. In a gramophone a recording stylus pressing by its own elasticity upon the record tablet at right angles to its plane of vibratory movements, and consisting of a leaf spring terminating in an iridium point, substantially as described.

9. In a gramophone, a recording stylus composed of a leaf spring terminating in a tracing point in combination with one or more elastic non-sonorous dampers, substantially as described.

10. In a gramophone a recording stylus formed of a leaf spring terminating in a tracing point in combination with one or more sleeves of soft rubber upon the leaf spring for damping the same, substantially as described.

11. In a gramophone, the combination of a sound receiving diaphragm, a lever and a recording stylus carried by the same, both extending parallel but eccentrically over the diaphragm; with a connection between the center of the diaphragm and the lever, substantially as described.

12. In a gramophone, the combination of a sound receiving diaphragm a lever and a recording stylus carried by the same, both extending over the face of the diaphragm but eccentrically thereto, with a rigid connection between the center of the diaphragm and the free end of the lever, substantially as described.

13. In a gramophone, the combination of a circular sound receiving diaphragm, a lever and an elastic recording stylus both extending parallel with the diaphragm on the line of a chord, with a rigid connection between the center of the diaphragm and the free end of the lever, substantially as described.

14. In a gramophone, the combination of a sound receiving diaphragm, a lever and an elastic stylus carried by the same, both extending parallel, but eccentrically thereto; with a bracket rigidly connected with the center of the diaphragm and removably ce-

mented to the lever, substantially as described.

15. In a gramophone, the combination of a sound receiving diaphragm mounted in a suitable frame, a bracket adjustably mounted on said frame, a lever pivoted in said frame extending parallel to and eccentrically with reference to the center of the diaphragm, and an elastic recording stylus carried by the lever; with a mechanical connection between the center of the diaphragm and the free end of the lever, substantially as described.

16. In a gramophone a sound receiving diaphragm and a tube for conveying sound waves thereto in combination with a recording stylus receiving motion from the diaphragm, and a screw mounted in the sound conveying tube bearing centrally upon the diaphragm for adjusting the tension of the latter, substantially as described.

17. In a gramophone, the combination of a horizontal rotary table adapted to support a record tablet, and a vertical shaft free to move longitudinally, carrying the table; with a friction disk engaged by the under side of the table for rotating the latter, substantially as described.

18. In a gramophone the combination of a horizontal rotary table mounted upon a vertical shaft and adapted to support a record tablet; with a friction disk engaging the under side of the table and partly sustaining the weight of the table, whereby the latter is automatically maintained in frictional gear with said disk, substantially as described.

19. In a gramophone, the combination of a rotary horizontal table adapted to receive and support a flat record tablet; with a reservoir of a suitable fluid, such as alcohol, discharging upon the center of the table and tablet, and an annular pan disposed underneath the table for receiving the overflow of alcohol, substantially as described.

20. In a gramophone the combination of a horizontal rotatable table adapted to receive and support a record tablet; with a reservoir of alcohol discharging upon the center of the table and tablet, an annular pan disposed under the edge of the table for receiving the overflow of alcohol, and a friction disk bearing upon the under side of the table between the center of the same and the inner wall of the pan, substantially as described.

21. In a gramophone, the combination of a horizontal rotary table adapted to receive and support a record tablet, a recording diaphragm and stylus connected by gearing with the table to move radially over and with the stylus in operative relation to the same, substantially as described.

22. In a gramophone, the combination of a horizontal rotating table adapted to receive and sustain a flat record tablet, with a carriage movable in a line parallel to a radius of the table, a recording diaphragm and stylus carried by the carriage with the stylus in operative contact with the record tablet, and

gearing connecting the table with said carriage, substantially as described.

23. In a gramophone, a sound conveying tube provided with a mouth piece having a flaring opening for the application of the mouth of the speaker and a perforation in the side wall of the mouth piece separated from and spaced with reference to the mouth opening and shaped to correspond to the shape of the nostrils of the speaker, substantially as described.

24. In a gramophone a sound reproducing diaphragm in combination with a stylus lever extending diametrically across the same, and elastic in two directions at right angles to each other, substantially as described.

25. In a gramophone, the combination of a diaphragm and a stylus carrier composed of a leaf spring twisted at one point so as to bring the edge of one portion at right angles to the face of the other portion, whereby it is elastic in two directions, substantially as described.

26. In a gramophone the combination of a reproducing diaphragm and stylus; with a stylus carrier composed of a leaf spring extending flat-wise over the face of the diaphragm and edgewise over the edge of the diaphragm, substantially as described.

27. In a gramophone the combination of a reproducing diaphragm mounted in a suitable frame the latter being provided at one point with a boss or stop; with a double elastic stylus carrier composed of a twisted leaf-spring tending toward the diaphragm and against the boss or stop, substantially as described.

28. In a gramophone, a reproducing diaphragm and stylus in combination with an elastic stylus carrier extending over the face of the diaphragm and tending toward the same, with an adjustable connection between the diaphragm and stylus carrier and adjustable for varying the pressure between diaphragm and style carrier, substantially as described.

29. In a gramophone the combination of a reproducing diaphragm mounted in a suitable frame provided with a boss or stop; with a

double elastic stylus carrier tending toward the diaphragm and toward the stop, and elastic non-resonant dampers interposed between the style carrier and the diaphragm and between the style carrier and the frame and stop, substantially as described.

30. In a gramophone a sound reproducing diaphragm and a sound conveying tube for the same, with one or more non-resonant perforated diaphragms in the said tube for reducing the volume of sound conveyed to the ear substantially as described.

31. In a gramophone a recording stylus pivoted to move in response to the vibrations of a diaphragm and elastic in a plane at right angles to such motions, substantially as described.

32. In a gramophone, a reproducing stylus having a wedge-shaped point engaging the walls of the record groove, substantially as described.

33. In a gramophone reproducer, a stylus carried or formed by a spring fixed at one end to the diaphragm holder and freely extending across and beyond the same and operatively connected with the center of the diaphragm, substantially as described.

34. In a gramophone reproducer, a spring constituting or carrying a stylus, fixed at one end to the diaphragm holder and extending across and beyond the periphery of the same and freely pressing against the diaphragm, substantially as described.

35. In a sound reproducing apparatus consisting of a traveling tablet having a sound record formed thereon and a reproducing stylus shaped for engagement with said record and free to be vibrated and propelled by the same, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:

HENRY E. COOPER,
F. T. CHAPMAN.

L. GLASS.
OPERATING MECHANISM FOR PHONOGRAPHS.

No. 535,445.

Patented Mar. 12, 1895.

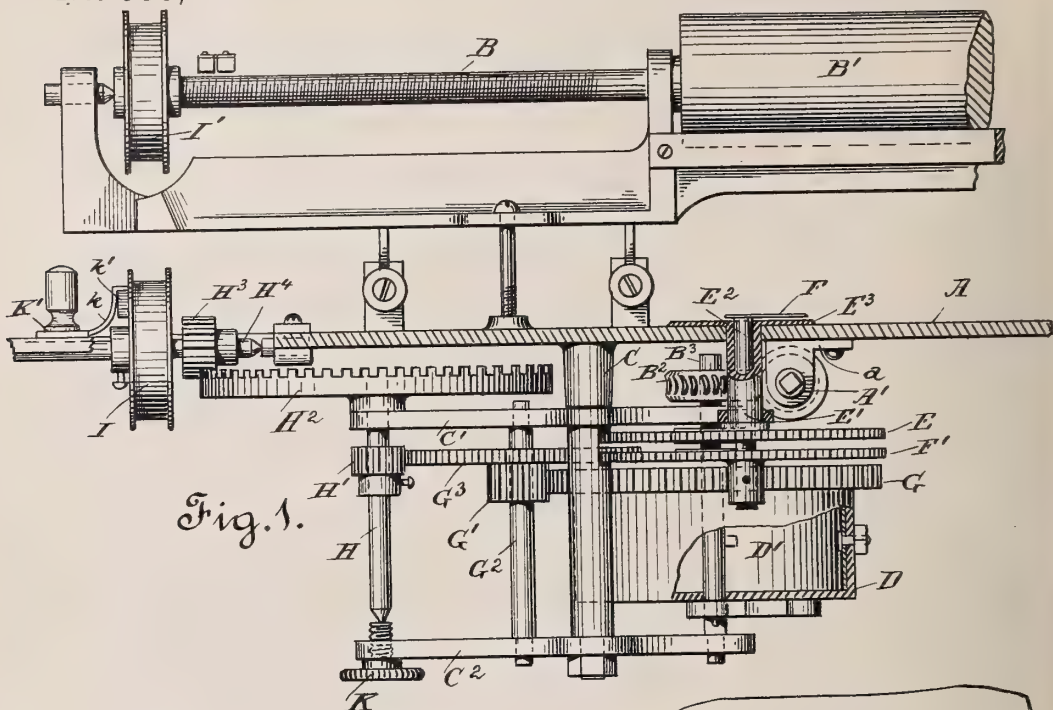


Fig. 1.

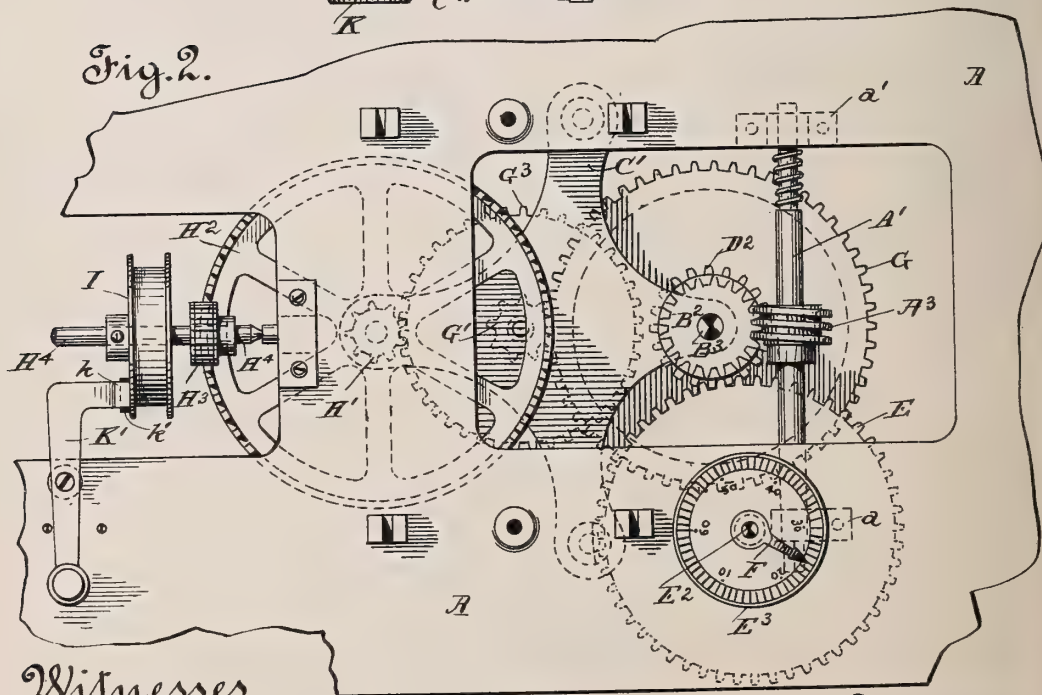


Fig. 2.

Witnesses.

H. Kortewerdt,

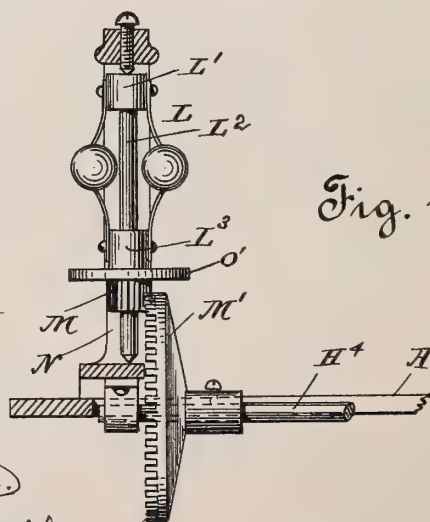
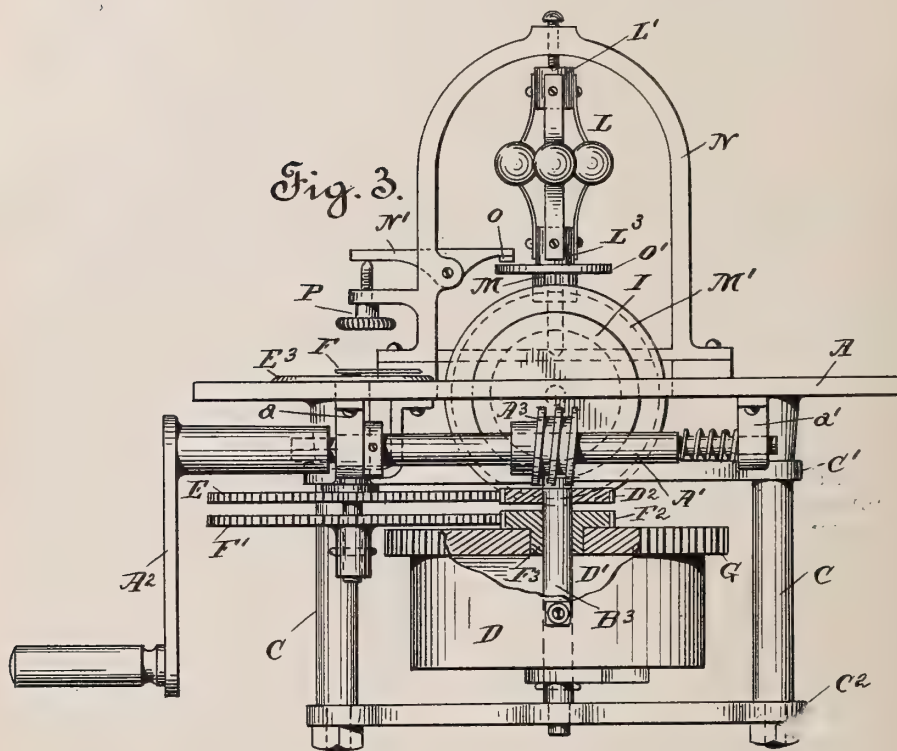
Edgar C. Humphrey

Inventor
Louis Glass
by *W. A. Ackers*
att'y

L. GLASS.
OPERATING MECHANISM FOR PHONOGRAPHS.

No. 535,445.

Patented Mar. 12, 1895.



Witnesses.

Stallanverde.

Edgar P. Humphrey

Inventor.
Louis Glass

by *W. A. L. L.*
att'y

UNITED STATES PATENT OFFICE.

LOUIS GLASS, OF SAN FRANCISCO, CALIFORNIA.

OPERATING MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 535,445, dated March 12, 1895.

Application filed February 16, 1894. Serial No. 500,412. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GLASS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Operating Mechanism for Phonographs; and I do hereby declare the following to be a full, clear, and exact description of said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

The present invention has relation to certain new and useful improvements in the operating mechanism of phonographs, which consists in the arrangement of parts and details of construction as will be hereinafter more fully set forth in the drawings, described and pointed out in the specification.

My invention comprises a phonogram cylinder adapted to receive rotation from a coiled spring, an indicator being provided which moves with the spring and indicates the reserve force of the same, governor balls being mounted upon a shaft connected with the phonogram cylinder and adapted to maintain the unwinding of the spring at a uniform speed. Upon the shaft which carries the governor balls I mount a disk with which a friction lever controlled by a thumb screw is adapted to be brought into engagement to adjust the speed of unwinding of the spring.

The object of my invention is to so construct the drive mechanism that the phonograph may be run for a length of time, say for an hour or more, with one winding of the spring mechanism, thus obviating the necessity of the operator rewinding the actuating mechanism each time the reproducer has traveled over the phonograph cylinder.

Referring to the drawings forming a part of this specification, wherein similar letters of reference denote corresponding parts throughout the entire specification and several views, Figure 1, is a front view in elevation with casing of the phonograph removed. Fig. 2, is a top plan of the same; Fig. 3, an end elevation thereof; and Fig. 4, a detail of the speed regulating governor.

The letter A is used to indicate the top of the frame, to which is hinged the ordinary casing of a phonograph, not shown, within which are contained and work the phonogram cylinder and reproducer, the reproducer traveling forward upon the screw-threaded shaft B, of the phonogram cylinder B'. The cylinder and reproducer are of the ordinary construction and work in the usual manner, and consequently need not be specifically described. From the under face of top A, downwardly extend the supports C, to which I secure the supporting plates C', C'', between which plates I locate the driving mechanism hereinafter described.

Within the downwardly extending brackets, *a, a'*, works the cross shaft A', one end of said shaft extending beyond the brackets *a*, and shaped to receive the crank A². By means of this crank said shaft is rotated and as rotated the worm collar A³, secured thereon, engages with the pinion B², and rotates the same in order to impart rotary motion to the vertical shaft B³. Upon this shaft is located the drum D, said shaft extending through the drum as shown. The drum and shaft I connect by means of the spring D', one end of which is fastened to the shaft and the other to the wall of the drum. Consequently as the shaft is rotated the spring is wound therearound. To this shaft, below the pinion B², is secured the pinion D², which pinion intermeshes with gear wheel E, fastened to the lower end of the sleeve E', which sleeve fits over the vertical shaft E². The upper end of the sleeve carries a dial or indicator plate E³.

Through the sleeve E', extends the vertical shaft E², to the upper end of which is fastened the indicating finger F, while upon the lower end is secured the gear wheel F', which gear intermeshes with the smaller gear or pinion F², which forms a part of the shell F³. This shell is rigidly secured to the drum D, and through the same extends the shaft B³.

The dial or indicator mechanism is used for the purpose of denoting whether the spring within the drum is wound or unwound and for this purpose the dial and finger have an independent movement. As the spring D', is

wound upon the vertical shaft B³, by the rotation thereof, the dial is revolved by the action of the pinion D², upon the gear E, the drum remaining stationary; while when the spring is unwound the drum D is revolved in the same direction as the shaft when winding the spring and the movement thereof is imparted to the shaft E² in order to revolve the indicator finger by the action of the pinion F², carried by the drum, upon the gear F', which is rigidly fastened to the shaft E².

It will be observed that the dial is provided with numerals around its outer face. Consequently by merely noting the position of the indicator finger on the dial face the operator is enabled to ascertain how near the spring is to being run down.

The upper plate of the drum is of greater diameter than the walls thereof and has teeth cut in the periphery, thus forming a large gear wheel G, the teeth of which intermesh with the pinion G', secured to the vertical shaft G². Consequently as the drum revolves the shaft is rotated through the medium of said pinion. Above this pinion there is secured the gear G³, which gear is rigid upon the shaft and rotates therewith. By means of this gear motion is imparted to the vertical shaft H, by reason of said gear intermeshing with pinion H', fixed thereon. Near the top of this shaft is secured the crown wheel H², which engages with gear wheel H³, secured to shaft H⁴, and transmits the motion of shaft G² thereto in order to revolve the belt wheel I, fastened on shaft H⁴, which wheel is connected to belt wheel I', by means of a belt not shown. The belt wheel I', being secured to the shaft B, causes the revolution of the phonogram cylinder. By transmitting the rotary motion of the spring actuated drum to belt wheel I, through the medium of a series of pinions, an increased speed is imparted to the phonogram cylinder. The shaft H works upon an adjustable bearing K, as shown.

To one side of the belt wheel I, is located the fulcrumed lever K', the arm *k* of which carries a brake shoe *k'*, which is adapted to engage with the wheel I, in order to stop the working of the machine by stopping the rotation of said belt wheel. The throwing on or off of this brake stops or starts the working of the machine.

Where the phonograph is used for home amusement or pleasure resorts my improved operating mechanism will be found of the utmost importance for the reason that after being once set in operation the machine may run for an hour, more or less, without requiring any attention on the part of the operator. By making the spring sufficiently strong and properly regulating the speed of the different gears and pinions, the phonograph may be made to run for days by one winding of the spring. Of course a weight may be made use

of in the place of a spring with equally good result, but in this case the winding shaft must act as the drum. The speed of the phonograph is regulated by the governor L, which is connected with the shaft H⁴. By means of this governor the speed of the phonograph may be increased or decreased as desired. This governor is secured to the collars L', L³, the upper one of which is movable upon the vertical shaft L², so as to slide up or down as the governor is thrown in or out by centrifugal force, while the lower one is rigidly fixed to the shaft. To the lower end of said shaft is secured the gear wheel M, with which the crown wheel M' meshes. This crown wheel is fixed to the shaft H⁴ and revolves therewith and imparts the motion thereof to shaft L², through the medium of gear M. In this manner the governor is connected to shaft H⁴.

To one side of the yoke N, which holds the vertical shaft L² in position, is fulcrumed the lever N', the inner end of which carries the brake shoe O, which shoe makes contact with disk O', as the outer end of lever N', is raised. The disk O', is rigidly fastened to shaft L², and the pressure of the brake shoe thereon regulates the speed of the governor, which controls the entire mechanism.

The lever N', is raised or lowered by means of the thumb screw P.

Having thus described my invention, what I claim as new, and desire to secure protection in by Letters Patent of the United States, is—

1. In a phonograph, the combination with the operating mechanism, of an indicator consisting of a dial and a finger or pointer above the dial independently connected with the operating mechanism whereby they will be non-simultaneously rotated in the same direction.

2. In a phonograph, the combination with the operating mechanism, of an indicating device for denoting the reserve power of the operating mechanism, said device consisting of a movable dial and a movable indicating finger, mechanism for rotating the dial with the setting of the operating mechanism, and devices for rotating the finger with the movement of the operating mechanism.

3. In a phonograph, the combination with a phonogram cylinder, of a coiled spring adapted in unwinding to impart rotation to said cylinder, an indicator moving with said spring and adapted to indicate the reserve force of the same, and governor balls mounted upon a shaft connected with said phonogram cylinder and adapted to maintain the unwinding of said spring at a uniform speed, substantially as described.

4. In a phonograph, the combination with a phonogram cylinder, of a coiled spring adapted in unwinding to rotate said cylinder, an indicator moving with said spring to in-

5 dicates the reserve force thereof, governor balls mounted upon a shaft connected with said phonogram cylinder and adapted to maintain the unwinding of said spring at a uniform speed, a friction disk mounted upon said shaft, and a friction lever controlled by a thumb screw adapted to be brought into engagement with said friction disk to adjust

the speed of unwinding of said spring, substantially as described. 10

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS GLASS.

Witnesses:

N. A. ACKER,

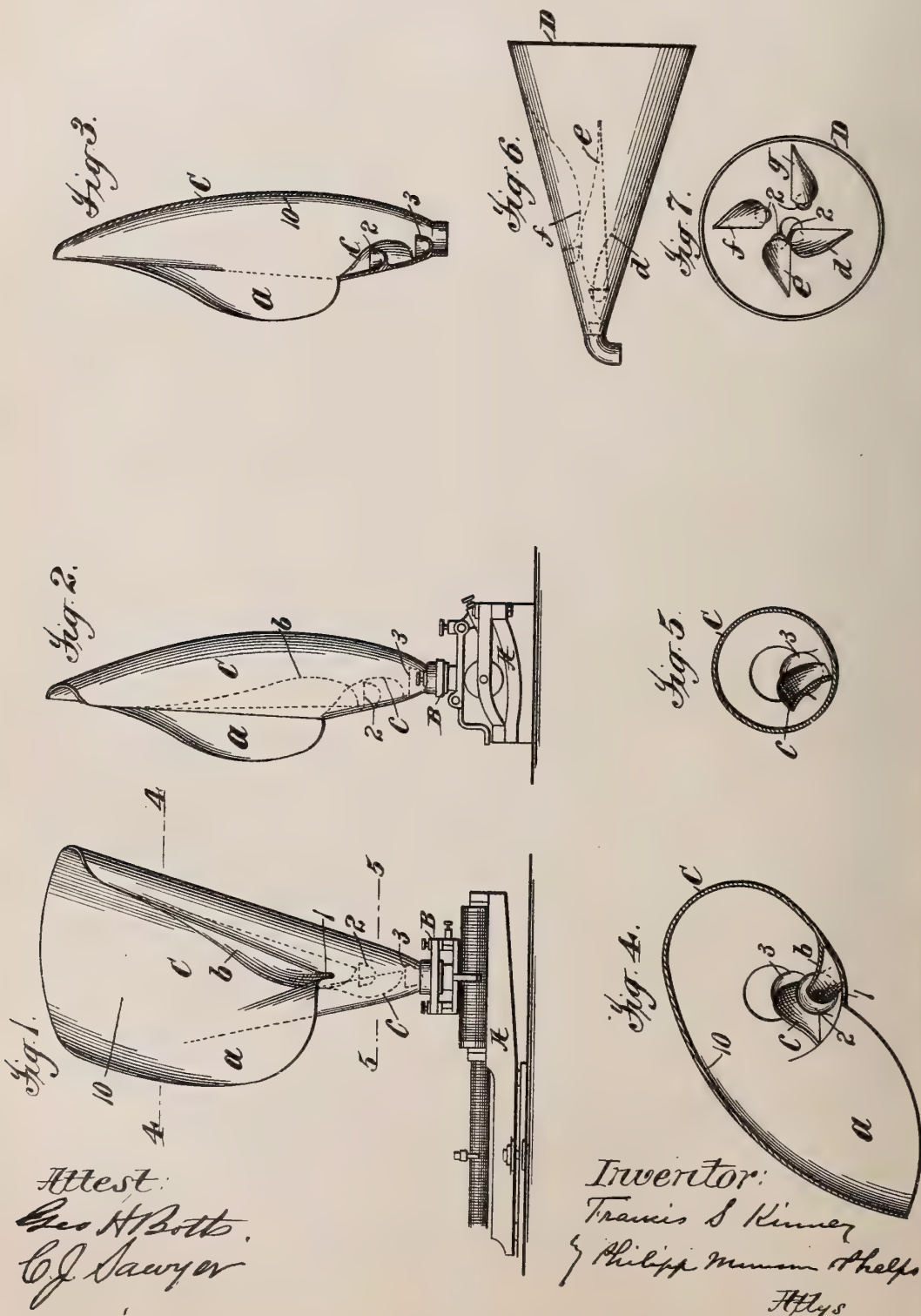
LEE D. CRAIG.

(No Model.)

F. S. KINNEY.
PHONOGRAPH RECEIVER.

No. 538,262.

Patented Apr. 30, 1895.



Attest:
Geo H. Bott,
Cf. Sawyer

Inventor:
Francis S. Kinney
{ Philipp Munn Phelps
Attys

UNITED STATES PATENT OFFICE.

FRANCIS S. KINNEY, OF PEQUANAC, NEW JERSEY.

PHONOGRAPH-RECEIVER.

SPECIFICATION forming part of Letters Patent No. 538,262, dated April 20, 1895.

Application filed December 13, 1894. Serial No. 531,679. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS S. KINNEY, a citizen of the United States, residing at Pequananac, county of Morris, and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Receivers and other Sound-Conducting Tubes, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The especial object of the present invention is to provide an improved recording apparatus of that class known as phonographs or graphophones, producing a record of sound waves by a style operated through a vibrating diaphragm by the sound waves to be recorded, the record thus produced being in turn used in the same or another machine to reproduce the recorded sounds, the present invention relating particularly to the receiver or sound conducting tube through which the sound waves are transmitted to the diaphragm. The improvements constituting the present invention, however, are applicable also to other classes of sound conducting tubes, such as speaking trumpets, telephone transmitters, &c., and the invention considered broadly includes such constructions embodying the improvements.

As the invention relates especially to and consists in part of an improved phonograph receiver, the improvements will be described especially in relation thereto and illustrated as embodied in such a construction.

In another application, Serial No. 509,791, filed May 2, 1894, I have described and claimed a phonograph receiver closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, the general form of the receiver, therefore, corresponding to that of an animal's ear in that the sound waves enter against the wall at the back of the ear and pass from the receiver at its base.

The present invention consists in part of improvements in this class of receivers, and for a full understanding of the invention, a detailed description of a construction embodying the same as applied in its preferred form to a receiver such as above described and to another class of receivers, will now be

given in connection with the accompanying drawings forming a part of this specification, and the features forming the invention will then be specifically pointed out in the claims.

In the drawings, Figure 1 is a front view of a phonograph recording apparatus provided with a receiver of the preferred form embodying the invention. Fig. 2 is a side view. Fig. 3 is a longitudinal section of the receiver. Figs. 4 and 5 are cross sections on respectively the lines 4 and 5 of Fig. 1, on an enlarged scale. Fig. 6 is a side view of a receiver of another class embodying certain features of the invention. Fig. 7 is an end view of the same.

Referring to Figs. 1 to 5, A is the phonograph or graphophone, which may be of any form desired, that shown being the well known Edison phonograph. To the diaphragm frame B of this phonograph is attached the receiver C so that the sound waves entering the receiver are transmitted to the diaphragm which operates the style. This receiver has an opening at the front through which the sound waves enter and is closed at the back opposite the opening, which back is curved or inclined downward and curved in cross section, the receiver gradually contracting to form a funnel connected to the diaphragm frame at its smaller end, directly, or by a short tube. At the base of the opening, or top of the funnel, the receiver is preferably provided with a short slit 1, as shown.

The receiver, and especially its upper part, is preferably made of resonant or sonorous material, which may be of any suitable character, but I have secured good results with thin metal. It may be made thicker or otherwise strengthened at the lower part.

The receiver is shown quite large, such as is preferably used in recording singing, but it will be understood that the invention is applicable also to smaller receivers.

The particular curve or incline at the back of the receiver and the taper of the funnel shown are not absolutely essential, although excellent results have been secured with a receiver of the form shown in these figures, and this form is preferred, but it will be understood that variations in the form may be made.

The receiver, so far as above described, is

or may be substantially the same as shown and described in my application above referred to.

In accordance with the present invention, the receiver is provided with one or more lips for the purpose of securing an increased volume of sound by reinforcing and concentrating the sound waves, the lip or lips being placed in proper relation to the opening and funnel to receive the sound waves or some of them and transmit them into or through the receiver properly for effect upon the diaphragm. I have found that much improved effects are produced by the use of a single lip placed outside the opening at which the sound waves enter the receiver so as to guide or transmit into the receiver some of the sound waves. Better effects are produced, however, by the use inside the receiver of a lip or lips, so formed as to guide or transmit the sound waves into or through the funnel, and this effect is improved greatly by the addition of one or more lips within the funnel so formed as to guide or transmit the sound waves therefrom through the funnel properly for action on the diaphragm. The best results are secured by the combination of a lip outside the opening and two or more lips inside and arranged longitudinally of the receiver, so as to receive the sound waves successively and guide or transmit them through the receiver to the diaphragm. I have found, also, that an improvement in the result is secured by placing below each of the lips within the receiver a small pocket formed by a ledge projecting from the wall of the receiver within the funnel and provided with a slight depression.

The lips may be formed of any material suitable for use in the transmission of sound waves, as described, the material used being preferably of such resonance as to secure as largely as practicable the effect of fortifying or increasing the amplitude of the sound waves. I have secured excellent results with thin highly resonant metal, such as brass, and this is recommended. The pockets also are preferably made of the same material.

The position and form of the lips may be varied to some extent and satisfactory results be secured, and, as stated above, the number of lips used may be varied. It is preferable, however, that the lips should be curved so that each forms a part of a long spiral, thus acting to guide the sound waves through the funnel, and that the successive lips, where two or more are employed, be so arranged on opposite sides of the receiver and on such spiral curves, that the sound waves are guided by each lip to the next lip, and so on through the series of lips, this being found to secure a greatly improved result. It will be found an important feature, also, especially in receivers of the special class described and claimed in the application above referred to, to form the rear wall of the receiver on such a curve as to guide the sound waves in a

curved or spiral path to the first lip within the receiver by which the sound waves are transmitted onward. Where an outer lip is employed, this will preferably form a prolongation of said curve on one side of the receiver, this outside lip also being curved on a long spiral extending longitudinally of the receiver. This feature of spiral guides for the sound waves is an important part of the invention, broadly considered and independently of any special form of construction by which such guides for the sound waves may be provided.

The construction shown in Figs. 1 to 5 embodies all the features of invention above described in a form which I have found efficient and which will now be fully described.

The wall of the receiver C is curved outward at one side of the opening at which the sound waves enter, so as to form a curved lip *a* extending from the top of the receiver down nearly to the top of the funnel, this lip *a* being curved on a long spiral from its top downward and through its upper part forming a curve which is continuous with the curve 10 of the rear wall of the receiver, which, as shown in Fig. 4, is a curve of decreasing radius terminating at the opposite edge of the opening. The wall of the receiver on the opposite side of the opening is curved inwardly to form a lip *b* at the end of the curve 10 and which extends downwardly in a long spiral curve and terminates within the funnel a short distance below the slit 1, this lip being so formed and positioned as to receive the sound waves and guide them downward to the funnel. On the opposite side of the receiver from the lip *b* and preferably commencing a short distance above the funnel, as shown, is a third lip *c* of substantially the same form as lip *b* and extending nearly to the lower end of the funnel in the construction shown, this lip acting to guide or transmit sound waves received thereby through the funnel. Just below each of the lips *b*, *c* in the construction shown, is placed a pocket, these pockets 2, 3, being shown as formed by depressions in a small ledge projecting inwardly from the front wall of the receiver and formed integral therewith. These pockets, however, while desirable, are not essential, and may be omitted, or may be formed in any other suitable manner, as by securing a piece of suitable material to the inside of the receiver.

It will be understood that the lips *a*, *b* need not be formed by curving the edges of the receiver, as shown, although this forms a simple and efficient construction, but that they may be formed by attaching properly shaped pieces to the receiver, and that, as above stated, the number and position of the lips may be varied and will depend somewhat upon the size and form of the receiver to which the lips are applied.

In Figs. 6 and 7, I have shown a construction embodying the broad features of the invention as applied to phonograph receivers of the com-

mon form having a conical funnel in which the sound waves are received at the large end longitudinally of the funnel. As shown, this receiver D is provided with four lips *d, e, f, g* each formed on a spiral curve on the inside of the receiver and arranged in series longitudinally of the funnel so as to receive the sound waves successively, the successive lips being placed on opposite sides of the funnel. At the inner end of each of these lips is placed a pocket 2, substantially the same as previously described in connection with Figs. 1 to 5, but it will be understood, however, that, as in the construction previously described, these pockets may be omitted. It will be understood, also, that, in phonograph receivers of the form shown in Figs. 6 and 7, the number and position of the lips may be varied, but the form shown will be found to produce excellent results.

What is claimed is—

1. A sound conducting tube, having one or more lips extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

2. A sound conducting tube, having one or more lips within the tube extending into the passage for the sound waves and longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

3. A sound conducting tube having one or more spiral guides for the sound waves extending longitudinally of the tube, substantially as described.

4. A sound conducting tube having a series of spiral guides within and extending longitudinally of the tube, substantially as described.

5. A sound conducting tube, having one or more lips within the tube extending into the passage for the sound waves and curved in a spiral extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

6. A sound conducting tube having a series of lips extending longitudinally of the tube and arranged to receive the sound waves successively and transmit them through the tube, substantially as described.

7. A sound conducting tube having a series of lips curved in a spiral extending longitudinally of the tube and arranged to receive the sound waves successively and transmit them through the tube, the successive lips being arranged on opposite sides of the tube, substantially as described.

8. A sound conducting tube having one or more lips within the tube extending into the passage for the sound waves and longitudinally of the tube and arranged to receive and transmit the sound waves, and a pocket, as 2, at the end of the lip or lips, substantially as described.

9. A sound conducting tube having a series of lips curved in a spiral extending longitudinally of the tube and arranged to receive the

sound waves successively and transmit them through the tube, the successive lips being arranged on opposite sides of the tube, and a pocket, as 2, at the end of the lip or lips, substantially as described.

10. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

11. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips inside the receiver extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

12. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having a lip at the side of and outside the opening and one or more lips inside the receiver extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

13. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips inside the receiver extending longitudinally of the tube and arranged to receive and transmit the sound waves, and having a pocket, as 2, at the end of the lip or lips, substantially as described.

14. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having a series of lips curved in a spiral extending longitudinally of the tube and arranged to receive the sound waves successively and transmit them through the tube, the successive lips being arranged on opposite sides of the tube, substantially as described.

15. A sound conducting tube closed at the back of the opening for the sound waves and having a funnel extending transversely to the direction in which the sound waves enter, and having the back curved from one side to the other transversely to the funnel and on a curve of gradually decreasing radius, and a lip within the tube terminating said curve and curved in a spiral extending longitudinally of the tube, substantially as described.

16. A sound conducting tube closed at the back of the opening for the sound waves and having a funnel extending transversely to the direction in which the sound waves enter, and

having the back curved from one side to the other transversely to the funnel and on a curve of gradually decreasing radius, substantially as described.

5 17. A phonograph recording receiver closed at the back of the opening for the sound waves and having a funnel extending transversely to the direction in which the sound waves enter and having one or more lips inside the
10 opening extending longitudinally of the receiver and arranged to receive and transmit the sound waves, substantially as described.

15 18. A phonograph recording receiver closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips within the receiver curved in a spiral
20 extending longitudinally of the receiver and arranged to receive and transmit the sound waves, substantially as described.

19. A phonograph recording receiver closed at the back of the opening for the sound waves and having its funnel extending from said
25 opening transversely to the direction in which the sound waves enter, and having a lip *b* inside the opening arranged to transmit the sound waves therefrom into the funnel, and a lip *c* in the funnel arranged to transmit the
30 sound waves through the funnel, substantially as described.

20. A phonograph recording receiver closed

at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which
35 the sound waves enter, and having a lip *a* at the side of the opening arranged to transmit the sound waves therefrom into the receiver, a lip *b* inside the opening arranged to transmit the sound waves therefrom into the funnel, and a lip *c* in the funnel arranged to
40 transmit the sound waves through the funnel, substantially as described.

21. A phonograph recording receiver closed at the back of the opening for the sound waves
45 and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having a lip *a* at the side of the opening arranged to transmit the sound waves therefrom into the receiver, a lip *b* inside the opening arranged to transmit the sound waves therefrom into the funnel, a lip *c* in the funnel arranged to transmit the sound waves through the funnel, and a pocket below each of the lips *b*, *c*, substantially as described.
50
55

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANCIS S. KINNEY.

Witnesses:

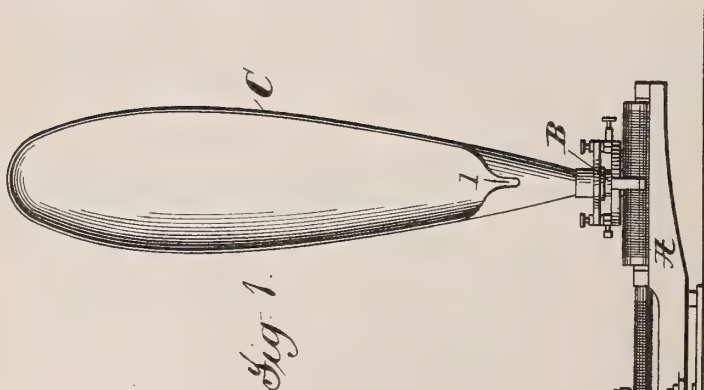
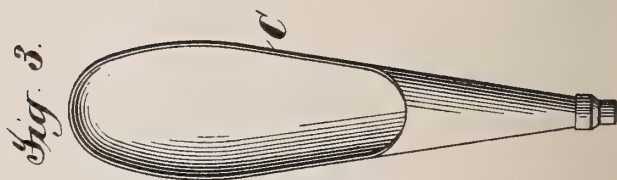
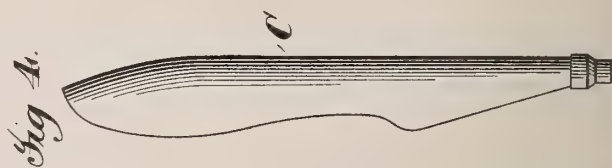
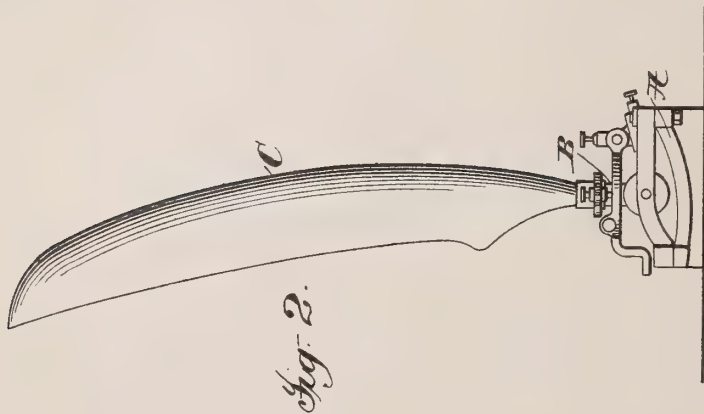
T. F. KEHOE,
C. J. SAWYER.

(No Model.)

F. S. KINNEY.
PHONOGRAPH RECEIVER.

No. 538,263.

Patented Apr. 30, 1895.



Attest:
C. J. Sawyer
By H. B. Botts

Inventor:
Francis S. Kinney
by
Philip Munson
Phelps Attys

UNITED STATES PATENT OFFICE.

FRANCIS S. KINNEY, OF PEQUANAC, NEW JERSEY.

PHONOGRAPH-RECEIVER.

SPECIFICATION forming part of Letters Patent No. 538,263, dated April 30, 1895.

Application filed May 2, 1894. Renewed February 26, 1895. Serial No. 539,809. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS S. KINNEY, a citizen of the United States, residing at Pequananac, county of Morris, and State of New Jersey, have invented certain new and useful Improvements in Phonographs, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to provide an improved recording apparatus of that class known as phonographs or graphophones, by which a record of sound waves is produced by a style operated through a vibrating diaphragm by the sound waves to be recorded, the record thus produced being in turn used in the same or another machine to reproduce the recorded sounds.

The present invention relates particularly to the receiver or sound conducting tube through which the sound waves are transmitted to the diaphragm.

In constructions heretofore in use, the sound waves have been transmitted to the diaphragm by using a funnel shaped receiver connected at its small end to the diaphragm frame either directly or by a flexible tube, the sound waves entering the large end of the funnel and longitudinally of the latter. The results attained have been fairly satisfactory in recording the human voice in speaking and low voices in singing, provided care and skill be exercised in regard to the position of the speaker or singer, but no satisfactory results have been secured in recording high voices in singing and similar sounds.

I provide a phonograph recording apparatus, by which greatly improved results may be secured, especially in recording high voices in singing and similar sounds, by the use of a receiver having a mouth piece closed at the back to form a wall receiving the sound waves from the voice and with the mouth piece contracting to form a funnel extending transversely to the mouth piece and through which the sound waves pass to the diaphragm. The general form of the receiver, therefore, corresponds to that of an animal's ear in that the sound waves enter against a wall at the back of the ear and pass from the receiver at its base. The ear form is also preferably used for the opening forming the mouth piece, this

being made of the elongated or oval form to secure the best results, although good results may be secured with other forms.

For a full understanding of the invention, a detailed description of constructions embodying the same in the preferred form will now be given in connection with the accompanying drawings forming a part of this specification and the features forming the invention then be specifically pointed out in the claims.

In the drawings, Figure 1 is a front view of a phonograph recording apparatus provided with my improved receiver. Fig. 2 is a side view. Figs. 3 and 4 are similar views of a slightly modified receiver.

Referring to said drawings A is the phonograph or graphophone which may be of any form desired, that shown being the well known Edison phonograph. To the diaphragm frame B of this phonograph is attached the receiver C so that the sound waves entering the receiver are transmitted to the diaphragm which operates the style. This receiver is shown in Figs. 1 and 2 as having an elongated or oval opening at the front through which the sound waves enter and closed at the back, which is curved downward and in cross section, the receiver gradually contracting to form a funnel connected to the diaphragm frame at its smaller end, directly or by a short tube. At the bottom of the opening or top of the funnel the receiver is preferably provided with a short slit 1, as shown. The receiver, and especially its upper part, is preferably made of quite thin resonant material. I have secured good results with metal. It may be made thicker or otherwise strengthened at the lower part. The receiver is shown as quite large, such as is preferably used in recording singing, but it will be understood that the same form may be used for smaller receivers.

The particular curve at the back of the receiver and the taper of the funnel shown in Figs. 1 and 2 are not essential, although excellent results have been secured with the receiver shown in these figures.

In Figs. 3 and 4 is shown a receiver in which the back wall is approximately straight and the funnel longer, with which very good results have been secured.

Many other variations in the form of the re-

ceiver may be made while retaining the features of the invention, as defined by the claims, and I am not to be limited to the exact form of any part of the receivers shown.

5 What I claim is—

1. A phonograph recording receiver closed at the back of the opening for the sound waves, and having its funnel extending from said opening transversely to the direction in
10 which the sound waves enter, substantially as described.

2. A phonograph recording receiver having at the back of the opening for the sound waves a wall curved in cross section and receiving the sound waves, and having a funnel
15 contracting from said wall and the base of the opening and extending transversely to the di-

rection in which the sound waves enter, substantially as described.

3. A phonograph recording receiver closed at the back of the opening for the sound waves, and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having a slit at the base of the opening, substantially
25 as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANCIS S. KINNEY.

Witnesses:

C. J. SAWYER,
T. F. KEHOE.

(No Model.)

E. H. AMET.
APPARATUS FOR REPRODUCING PHONOGRAMS.

No. 539,212.

Patented May 14, 1895.

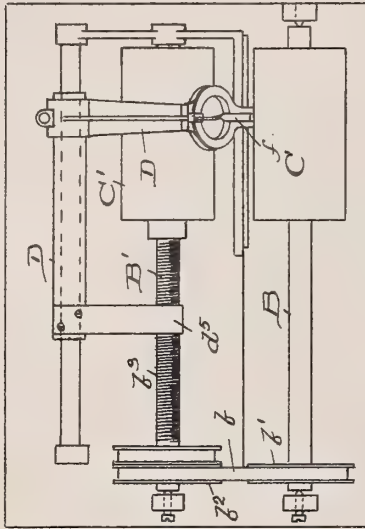
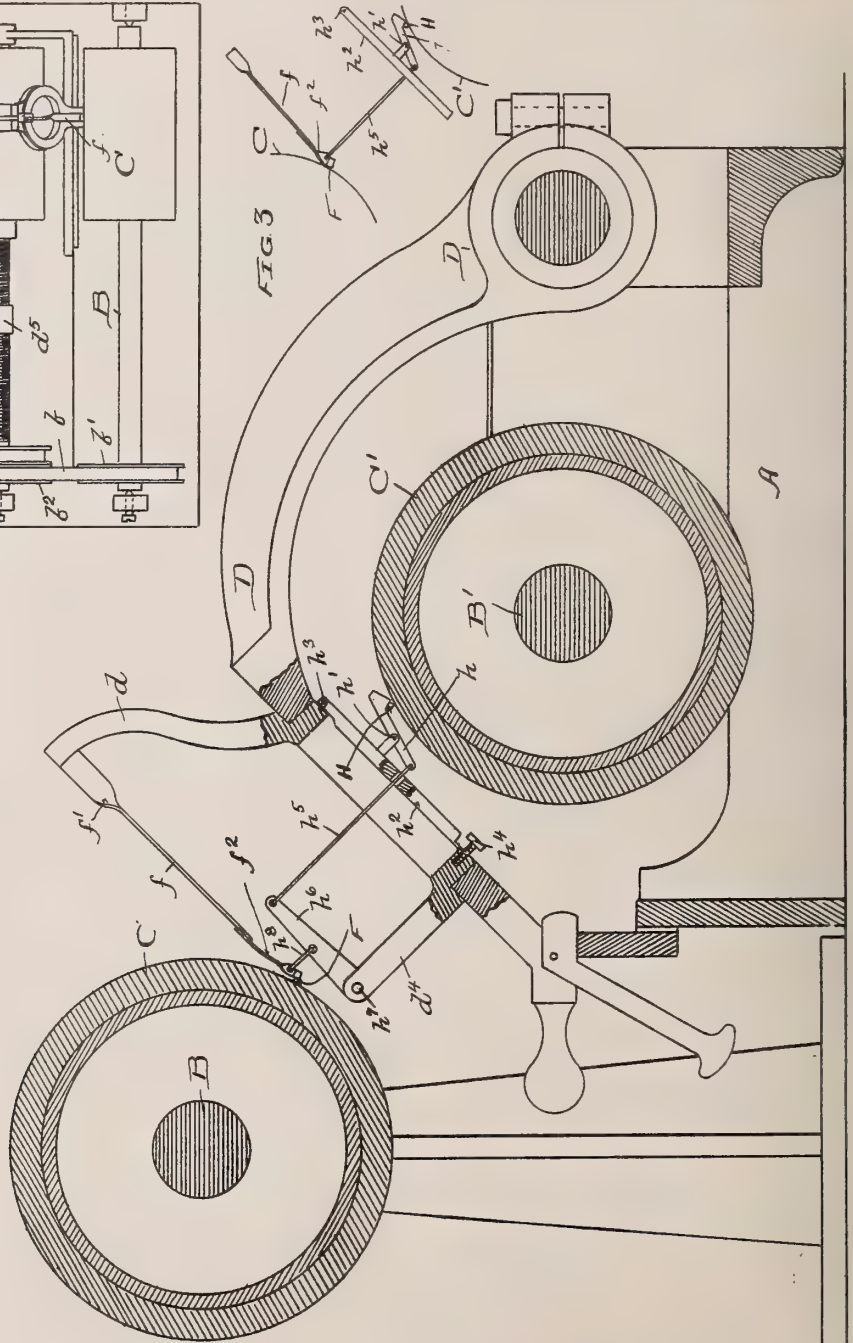


FIG. 1.

FIG. 2.



WITNESSES:

Sam. C. Curtis
A. W. Munday

INVENTOR:

EDWARD H. AMET

By Munday, Evans & Adcock

HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF WAUKEGAN, ASSIGNOR TO CHARLES DICKINSON, OF CHICAGO, ILLINOIS.

APPARATUS FOR REPRODUCING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 539,212, dated May 14, 1895.

Application filed January 9, 1895. Serial No. 534,320. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing in Waukegan, in the county of Lake and State of Illinois, have invented a new and useful Improvement in Apparatus for Reproducing Phonograms, of which the following is a specification.

My invention relates to the copying or reproduction of phonograms or sound writings.

My invention consists in the novel construction of parts and devices and novel combinations of parts and devices herein shown and described and specified in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a plan view of an apparatus suitable for use in practicing my invention and embodying the machine or apparatus features of my invention. Fig. 2 is an enlarged vertical cross-section taken on line 2 2 of Fig. 1, and Fig. 3 shows a modification.

In the drawings A represents the frame and B and B' the revolving shafts or holders for holding and revolving synchronously the original phonogram cylinder C and the similar cylinder C' upon which the copy is to be made.

D is the traveling head, frame or slide, upon which the reproducing or following stylus F and the recording or engraving stylus H are mounted. The reproducing stylus F is, or should be, of the usual round pointed jewel-form, and it is secured to a two-way, thin, light flexible spring f , preferably of steel. This spring f is made two-way for the purpose of giving the stylus F the necessary freedom of movement laterally to follow the lines of writing on the cylinder C and also the necessary freedom of movement up and down to follow the elevations and depressions of the sound writing on said cylinder. The spring f can be most conveniently made flexible in two directions by simply giving it a twist f' . By making the spring arm f thus capable of yielding in two directions I obviate the necessity and expense of pivotally mounting said arm upon its support d .

To give opportunity for easily adjusting the direction and position of the reproducing stylus F in relation to the cylinder C I preferably provide the spring arm f with an ex-

tension f^2 of copper or other pliable and little resilient material. This makes a means for adjustment of the position and direction of the stylus, which is not only lighter and cheaper but more convenient than adjusting screws or other means.

The recording or engraving stylus H is preferably of the usual sharp pointed jewel construction familiar to those skilled in the art, and it is carried by a lever h which is pivoted at h' to a weight or weighted arm h^2 , which itself is pivoted at h^3 to the head D. At the free end of the weighted arm h^2 is an adjustable stop h^4 to limit the movement of the weighted arm. The end of the lever h opposite to the stylus H is connected by a flexible link h^5 to the stylus F; this being done preferably through an intermediate lever h^6 pivoted at h^7 to an arm d^4 on the head D, and which lever h^6 is connected by a link h^8 with the stylus F, or its supporting arm. As shown in Fig. 2 the intermediate lever also serves to multiply the movement, thus tending to make the copy of greater clearness and volume than the original. In the modification shown at Fig. 3 the intermediate lever h^6 is omitted and the link connection made direct between the arm of the reproducing stylus and the lever or arm carrying the recording stylus.

The link connection between the reproducing stylus and the recording stylus, whether the same be made in one piece, as indicated in Fig. 3, or in two pieces $h^5 h^8$, as indicated in Fig. 2, is preferably made, I find, of lead wire, or other substance possessing little elasticity, though it may be made of any suitable material.

The two shafts B and B' are revolved synchronously by a belt b on the pulleys b' b^2 . The traveling head, slide or frame D is fed or reciprocated by a feeding screw b^3 on the shaft B engaging a screw threaded arm or nut d^5 secured to the head D.

It will be observed that the end of the recording stylus lever h to which the link h^5 is connected, moves directly in unison with the reproducing stylus F, while the recording stylus H on the opposite end of this lever moves reversely in unison with the reproducing stylus F; so that a depression on the cylinder C forms a corresponding depression on

the cylinder C' , and in like manner an elevation on the cylinder C forms a corresponding elevation on the cylinder C' ; thus making the cylinder C' a direct instead of a reverse copy of the cylinder C , and, as the connection between the reproducing stylus F and the recording stylus H is direct or mechanical, without the intervention of vibrating diaphragms or sound waves in the air, the copy C' is necessarily an exact and perfect copy of the original C .

The spring arm f serves to hold the reproducing stylus F properly in contact with the original phonogram cylinder C , and the weighted arm h^2 serves to keep the recording stylus H properly in contact with its cylinder and the link connection between the two styli taut or under tension, so that the movement of the stylus F is properly communicated to the stylus H .

I claim—

1. The combination with revolving shafts BB' for holding and revolving the cylinders C C' , of a traveling head D , reproducing stylus F secured to a spring arm, recording stylus H secured at one end of a lever h , said lever h , a weighted arm h^2 to which said lever h is pivoted, and a link connection between the opposite end of said lever h and said reproducing stylus, said reproducing stylus carrying spring arm f , being a spring flexible in two directions, substantially as specified.

2. The combination with revolving shafts BB' for holding and revolving the cylinders C C' , of a traveling head D , reproducing stylus F secured to a spring arm, recording stylus H secured at one end of a lever h , said lever h , a weighted arm h^2 to which said lever h is pivoted, and a link connection between the opposite end of said lever h and said reproducing stylus, said reproducing stylus carry-

ing spring arm f having an extension f^2 of flexible, non-resilient material, substantially as specified.

3. The combination with revolving shafts BB' for holding and revolving the cylinders C C' , of a traveling head D , reproducing stylus F secured to a spring arm, recording stylus H secured at one end of a lever h , said lever h , a weighted arm h^2 to which said lever h is pivoted, and a link connection between the opposite end of said lever h and said reproducing stylus, and an intermediate lever h^6 inserted in the connection between said lever h and said stylus F , substantially as specified.

4. In a phonogram reproducing or copying mechanism, the combination with a reproducing stylus mounted on a spring arm, of a recording stylus mounted on a weighted arm, and a connection between said spring arm and said weighted arm, said connection being provided with a lever for multiplying the movement, substantially as specified.

5. In a phonogram reproducing or copying mechanism, the combination with a reproducing stylus mounted on a two-way spring arm, of a recording stylus mounted on a weighted lever and a connection between said lever and said spring arm, substantially as specified.

6. In a phonogram reproducing or copying mechanism, the combination with a reproducing stylus mounted on a spring arm, of a recording stylus mounted on a weighted arm, and a lead wire connection between said spring arm and said weighted arm, substantially as specified.

EDWARD H. AMET.

Witnesses:

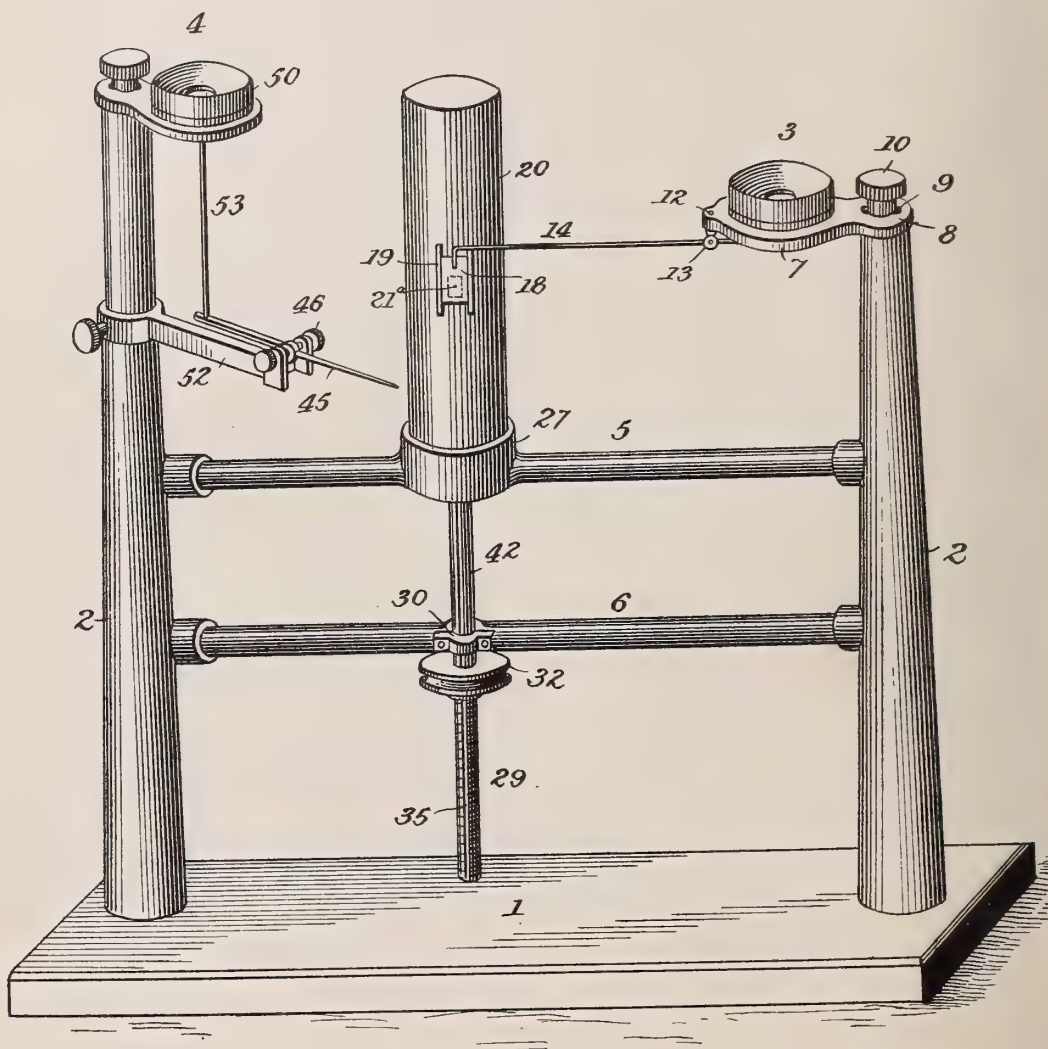
H. M. MUNDAY,
L. E. CURTIS.

(No Model.)

2 Sheets—Sheet 1.

A. C. FERGUSON.
RECORDING AND REPRODUCING SOUND WAVES.
No. 539,254. Patented May 14, 1895.

Fig. 1.



Witnesses
J. H. H. H.
C. E. E. E.

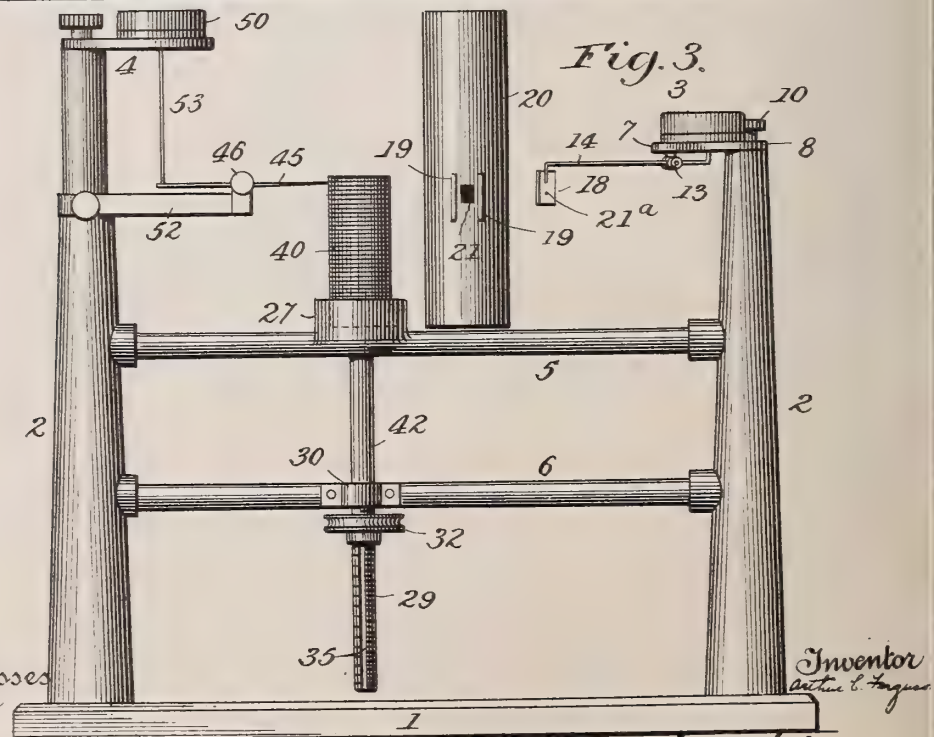
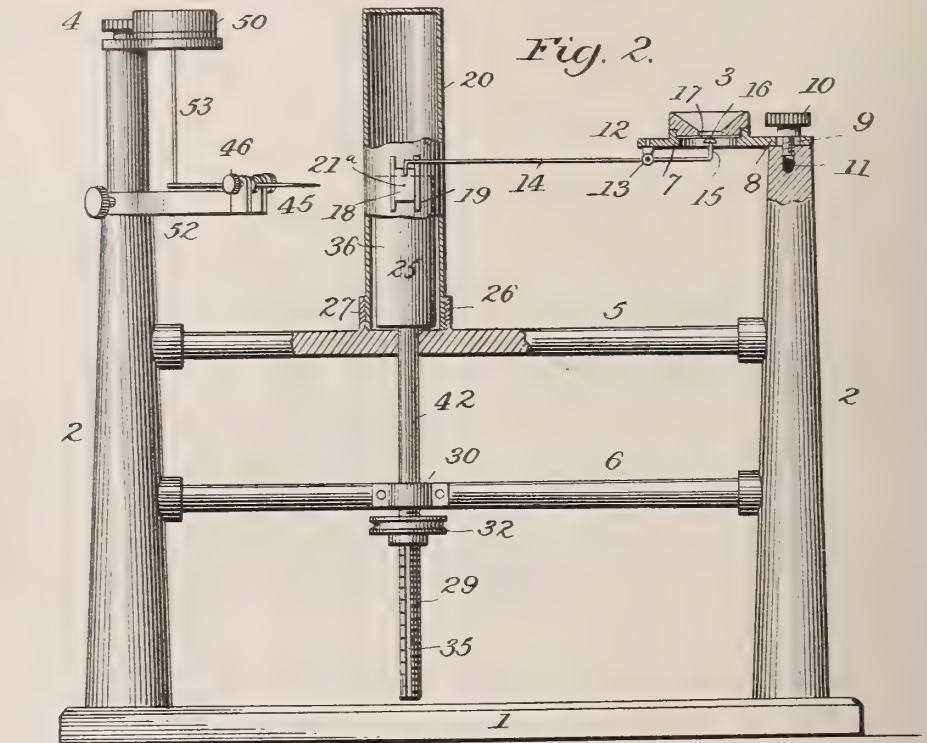
Inventor
Arthur C. Ferguson
by *James Freeman*
Attorneys

A. C. FERGUSON.

RECORDING AND REPRODUCING SOUND WAVES.

No. 539,254.

Patented May 14, 1895.



Witnesses
Judy Hinkel

Edmund Elles

Inventor
Arthur C. Fergusson.

by Foster Freeman
Attorneys

Attorneys

UNITED STATES PATENT OFFICE.

ARTHUR C. FERGUSON, OF SARATOGA SPRINGS, NEW YORK.

RECORDING AND REPRODUCING SOUND-WAVES.

SPECIFICATION forming part of Letters Patent No. 539,254, dated May 14, 1895.

Application filed March 7, 1895. Serial No. 540,844. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR C. FERGUSON, a citizen of the United States, residing at Saratoga Springs, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Means for Recording and Reproducing Sound-Waves, of which the following is a specification.

This invention relates to means for recording and reproducing sound waves, and it consists substantially in such features of improvement as will hereinafter be more particularly described.

The invention is adapted for the recording and reproduction of articulate speech and all musical sounds alike, and it has for its object to provide a permanent record, as well as a more faithful reproduction than has heretofore been accomplished.

The invention is distinguished from that class of devices wherein the original impulses or vibrations are photographically recorded and subsequently reproduced either photographically or electrically, in that the sound waves are photographically recorded and the reproduction or retransmission of the same is effected by mechanical means, thereby enabling me to both record and reproduce the sound waves by the use of but one machine.

Generally speaking, the invention comprises photo-mechanical devices by which a beam of light is projected onto a rotating or movable film in sinuous lines, the altitudes of which are in accordance with the amplitudes of the vibrations of the diaphragm, and the number or recurrence of which lines are in accordance with the rates of such vibrations.

In the accompanying drawings, Figure 1 is a view in perspective of a photomechanical sound recording and reproducing device embodying the features of my invention. Fig. 2 is a side elevation, partly in section, representing the recording-needle in position for operation and the reproducing-needle as turned to one side. Fig. 3 is a side view representing the recording-needle as thrown out of operative position and the reproducing-needle in a position for use.

While my invention is capable of being constructed or carried into effect in a great many different ways, for the purpose of simplicity

and cheapness of cost, I provide a machine such as is indicated in the accompanying drawings, wherein 1 designates a suitable base, and 2, 2, each indicates a standard or upright, one of which supports the transmitter 3, and the other the receiver or reproducer 4, the said standards or uprights being connected in any suitable manner by means of the cross pieces 5 and 6. As will be observed on reference to the several figures the said transmitting device is supported so as to be capable of being swung or turned on its support, and while a great many constructions could be resorted to for this purpose, I preferably provide a plate or disk 7 having an offset or projection 8 formed or provided with an opening 9 through which passes a screw 10 which enters or passes into an opening 11 formed in the upper end of the standard or support 2. Thus by loosening the screw, I am enabled to turn the plate or disk in such manner as to carry the recording needle to one side substantially as is shown in Fig. 3 of the drawings. The said plate or disk 7 is also formed or provided with a small projection or offset 12 through which is inserted from beneath an adjusting device or screw 13, to the lower end of which is pivotally suspended the recording needle 14, the latter having at its outer end a small crook 15 having a rounded head 16 which normally bears very lightly against the under side of the diaphragm 17 of the said transmitting device 3; while to the opposite end of the said recording needle is attached in any suitable manner a shutter 18 of any suitable thin opaque material, which shutter, as the recording needle is caused to vibrate by the impulses imparted to the diaphragm, is in like manner made to vibrate or move up and down in guides 19 formed on the outer side of a sheath or casing 20, the latter being provided with an opening 21 before which the movements of the shutter take place. The said shutter is provided with a very fine opening 21^a, which, as is obvious, will cause a beam of light to be projected through the opening 21 of the casing in sinuous lines whenever the said shutter is caused to move up and down by the action of the needle when receiving motion from the vibrations of the diaphragm. The said sheath or casing 20 is for the purpose of closing over or sur-

rounding a rotating cylinder 25, and for the purpose of maintaining the casing stationary, the lower end of the latter is screw threaded at 26 to screw into or fit within a correspond-
 5 ingly screw-threaded socket 27, preferably in this instance formed with or attached to the upper cross piece 5 which connects the standards or uprights 2, 2. It is obvious that other means may be provided for supporting the
 10 said sheathing or casing to inclose the rotating cylinder but the means which I have shown and described are very simple and amply suffice for the purpose.

In order to impart to the cylinder 25 a rotating and gradually progressive movement, I attach the same in any suitable way at its lower end to the upper end of a rotating shaft 42 formed on its lower portion with a screw 29, and which screw threaded portion works
 20 in a screw bearing 30 by which to effect a gradual feed of the cylinder in an upward direction as the said shaft is rotated either by hand or from any suitable motor, a driving pulley 32 being held on the shaft and
 25 provided with a feather, (not shown) working in a groove 35 in the shaft so as to permit of the proper movement of the latter.

Around the rotating cylinder 25 I place in any suitable manner a sensitized photographic film 36, and then by properly inclosing the same by the sheath or casing and swinging the shutter around and placing the same within its guides on the casing, the machine is thus placed in readiness to record
 30 sound waves produced by the vibrations of the diaphragm 17. By talking into the transmitter or producing musical sounds therein, the diaphragm will vibrate, and the pulsations will be imparted to the recording needle which causes the shutter to move up and
 40 down before the opening in the sheath or casing. During this time, the machine is in motion and the cylinder 25 with its film is caused to rotate at the desired rate of speed, and the beam of light which passes through
 45 the opening in the shutter will be projected onto the surface of the film in sinuous lines in exact accordance with the amplitude of vibrations of the diaphragm.

It is to be understood that the opening in the sheath or casing is of sufficient dimensions to permit of recording the deepest sound wave of which the diaphragm is capable of producing, and thus am I enabled to record
 50 all varying degrees of sound in the most perfect manner.

When the entire surface of the film has been utilized in the recording of sound waves in the manner hereinbefore described, I then
 60 remove the entire machine to a photographic dark room and remove the sheath or casing, and then develop the sensitized film by the ordinary photographic process. As thus developed, the said films can of course be kept
 65 as long as desired, but in order to reproduce the sound waves delineated thereon, I trans-

fer the sinuous lines onto either a metal plate or cylinder, preferably in this instance a cylinder 40, and this cylinder is attached in any suitable manner to the upper end of the
 70 shaft 42, whereupon the reproducing needle 45 is swung around in such manner as to engage the lines on the cylinder, and then as the cylinder is rotated an exact reproduction of the sound waves will be produced through
 75 the medium of the diaphragm contained in the receiver 50. The construction of said receiver is in all important respects the same as the transmitter 3 with the exception that a bracket 52 is employed additionally as a
 80 support for the reproducing needle 45, the latter being centrally supported at 46 and operating at its outer end in connection with a fine rod 53 which transmits the sound waves on the cylinder to the diaphragm in the trans-
 85 mitter.

It will be understood, of course, that the transfer of the sinuous lines from the film to the plate or cylinder may be either in intaglio or relief and produce the same effect, and
 90 this transfer is effected either by etching or by any of the well known engraving or photo-engraving processes, it being unnecessary to specifically set forth such process herein.

It is thought that from the foregoing description, the construction and operation of my invention will be fully understood, and while I have herein set forth certain preferred forms of construction of the several parts of my apparatus, it is evident that various im-
 95 material changes could be resorted to without departing from the principles intended. For instance, I have herein stated that in order to develop the film after its surface has been completely utilized, the entire machine
 100 is removed to the dark room, whereas it is clearly evident that by slightly altering the construction of the machine, the removal of the film alone together with its surrounding sheath could be independently effected. In
 105 connection also with both the recording and reproducing needles, it will be understood that their construction and arrangement is capable of various modifications. For all practical purposes however, I have found the
 110 present construction to answer, and therefore I preferably resort thereto in the practice of my invention.

Without limiting myself to the precise construction and arrangement of parts shown, I
 115 claim as my invention—

1. In means for recording and reproducing sound waves, a gradually progressive rotating sensitized film, a sheath or casing inclosing the same and provided with an opening,
 120 a shutter of opaque material arranged before said opening and perforated, a receiver provided with a diaphragm, and a recording needle operated by the vibrations of said diaphragm and imparting corresponding vibra-
 125 tions to said shutter, substantially as shown and for the purpose described.

2. In means for recording and reproducing sound waves, a receiving or recording diaphragm supported so as to swing to one side, a recording needle pivoted to the frame of
5 said diaphragm with one end bearing lightly on the latter, a shutter carried by the opposite end of said needle, the rotating cylinder adapted to receive the film, means for rotating the said cylinder and gradually feeding the same, and a sheath or casing inclosing the cylinder provided with an opening before which the shutter is operated by impulses from the diaphragm, substantially as described.

15 3. In means for recording and reproducing sound waves, the combination of the rotating screw shaft adapted to support a cylinder, the receiving and reproducing diaphragms, the recording and reproducing needles, and
20 means whereby either one or both of said

needles may be swung to one side, substantially as shown and for the purpose set forth.

4. In means for recording and reproducing sound waves, a gradually rotating sensitized film, an inclosure therefor provided with an
25 opening, a shutter perforated and located before said opening, a receiving diaphragm, and devices intermediate of said diaphragm and shutter whereby the latter is operated in accordance with the vibrations of the diaphragm,
30 substantially as shown and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR C. FERGUSON.

Witnesses:

E. EVERETT ELLIS,
JNO. G. HINKEL.

539254

(No Model.)

L. GLASS.
PHONOGRAPH ATTACHMENT.

No. 539,806.

Patented May 28, 1895.

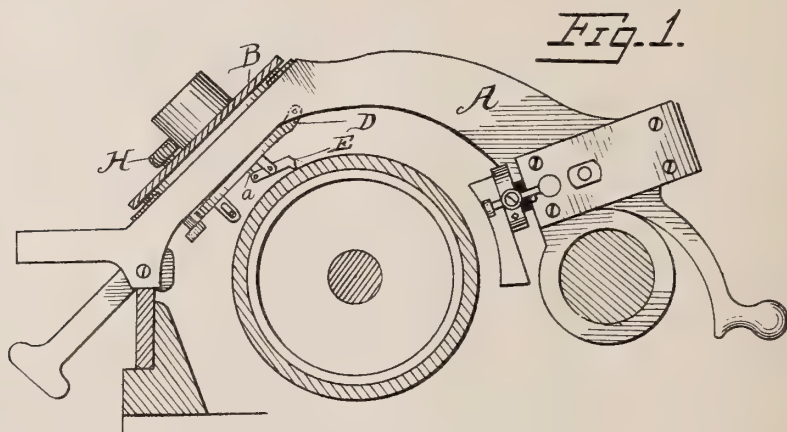


FIG. 2.

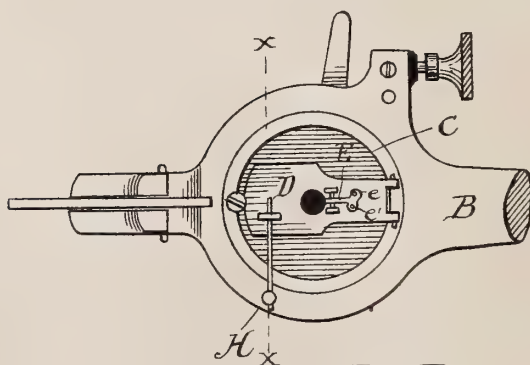
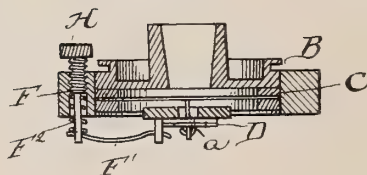


FIG. 3.



WITNESSES.

Albert Popkin,
Harry C. Davis.

INVENTOR.

Louis Glass
by W. A. Nicks
his Attorney.

UNITED STATES PATENT OFFICE.

LOUIS GLASS, OF SAN FRANCISCO, CALIFORNIA.

PHONOGRAPH ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 539,806, dated May 28, 1895.

Application filed May 31, 1894. Serial No. 513,027. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GLASS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Phonograph Attachments; and I do hereby declare the following to be a full, clear, and exact description of said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

My invention relates to certain new and useful improvements in phonograph attachments as will be hereinafter more fully set forth in the drawings, described and pointed out in the specification; and the object of my invention is to eliminate or overcome the vibratory movements (other than those actually imparted by the tones) of the diaphragm and its attachments, so as to perfect to the highest degree the registering on the phonogram cylinder of the sound undulations, and with same application to reproducing mechanism to the proper, full and correct intonation of the registered sounds.

Ordinarily, the substance used in a phonograph upon which sound vibrations are engraved opposes a resistance to the engraving tool or needle during the indenting wave, and inasmuch as little or no resistance is offered during the withdrawing wave, there is likely to be caused an irregular movement or vibration of the recording and reproducing mechanism.

I have discovered, that by the use of my improved attachments I overcome the undue vibration of the recording and reproducing mechanism and thus allow such a recording of the sound undulations as will substantially perfect the reproduction of the sound intonation, whether the recording be in heavy or light tones.

My invention consists in the combination and arrangement of the parts as more fully described hereinafter and as set forth in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a cross-sectional view, in side elevation, of the phonograph-cylinder. Fig. 2 is a bottom view; and Fig. 3, a front sectional view, in elevation, on line *xx*, Fig. 2.

A represents the arm of the traveling repro-

ducer, and B, the head thereof, within which is secured the diaphragm C. To the under side of the head B is pivoted the vibratory plate D, through which projects the finger *a*, which is attached to the diaphragm C. To the lower end of said finger is pivoted the arm E, adapted to carry the needle *e*, and cutter *e'*. Through the opening F formed in the reproducer-head extends a screw-threaded bolt H, the lower end of said bolt engaging one end of a tension spring F², arranged on the extended lower portion of the bolt, as shown. To the lower end of the screw-bolt is secured the outer end of a spring F', the opposite end of said spring bearing against the free end of the vibratory plate D, as clearly shown in Fig. 2, and serves to form a spring cushion for preventing the vibration of said plate. By means of the adjustable bolt H, I am enabled to regulate the tension of the spring or cushion F', by turning said screw and increasing the pressure of spring F', and consequently, increase or decrease the volume of sound.

By providing the compensation spring F' adapted to bear against the plate D, I overcome the undue vibrations thereof and cause the needle to record perfectly and uniformly when the phonograph is used in heavy or loud tones, thereby allowing of the reproduction thereof with its proper intonation, instead of a blurry or discordant reproduction as has heretofore been the case. Should, however, my invention be employed in connection with phonographs having distinct and separate recording and reproducing mechanism, it becomes necessary that the compensation spring, which forms an elastic cushion, be applied to each, inasmuch as if applied to the recording mechanism only, the indentations are formed so deep on the phonogram cylinder that undue vibration takes place in the reproducing mechanism or diaphragm. Consequently, it becomes necessary that a tension spring, elastic cushion, or similar devices be required in order to produce the pure tone.

I do not wish to be understood as confining myself to an adjustable compensation spring, as I am aware that an elastic cushion may be employed in place thereof applied to any part of the recording or reproducing mechanism.

Having thus described my invention, what

I desire to claim and secure by Letters Patent is—

1. The combination with a head carrying a diaphragm, and a finger secured to said diaphragm, of a vibrating plate hinged to said head and having a central opening therein through which the finger passes, an adjustable screw-threaded bolt fitted to said head, a spring connected with the free end of said plate at one end of the spring and with the lower end of the adjustable screw-bolt at the other end of said spring, and an arm pivoted to the under side of the vibrating plate and connected at one end with the extreme lower end of the finger, substantially as shown and described.

2. The combination with a head carrying a diaphragm and a finger, of a vibratory-plate hinged to the head and having an opening through which the finger passes, a threaded-bolt projected through the head, a tension-spring on the lower portion of the bolt, and a spring having one end secured to the lower end of the said bolt and arranged to bear with its other end on the vibratory-plate, substantially as and for the purpose specified.

3. The combination with a head carrying a diaphragm and a finger, of a vibratory-plate hinged to said head and having an opening through which the finger passes, an adjust-

able screw-threaded bolt fitted to said head, a cushion spring surrounding the lower portion of said bolt, a spring connected with the free end of said plate at one end and with the screw-bolt at the other end, and an arm pivoted to the under side of the hinged plate and connected at one end with the lower end of the finger, substantially as shown and described.

4. The combination with a head carrying a diaphragm and a finger, of a vibrating-plate hinged to said head and having an opening through which the finger passes, an adjustable screw-threaded-bolt fitted to said head, a cushion spring surrounding the lower portion of said bolt, a spring connected with the free end of the plate at one end and with the lower end of the screw threaded-bolt at the other end, and an arm pivoted to the under side of the vibrating plate, said arm carrying a needle and cutter at its free end, the other end being secured to the lower end of the finger, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS GLASS.

Witnesses:

LEE D. CRAIG,
N. A. ACKER.

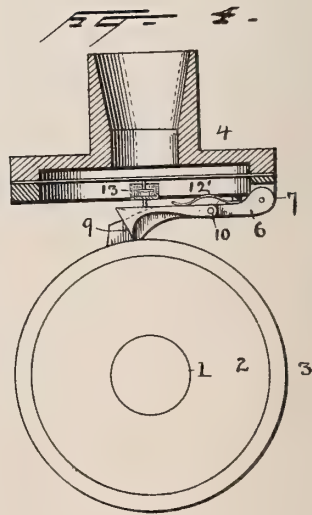
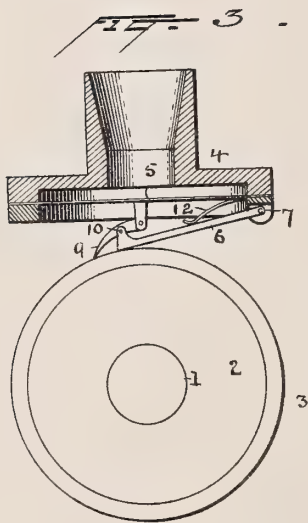
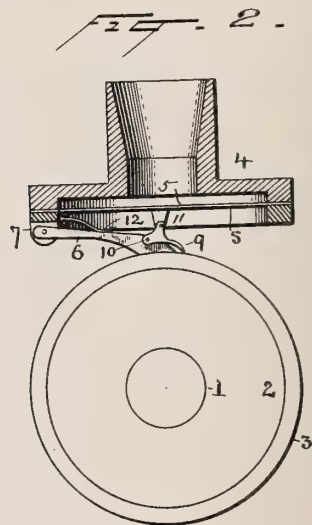
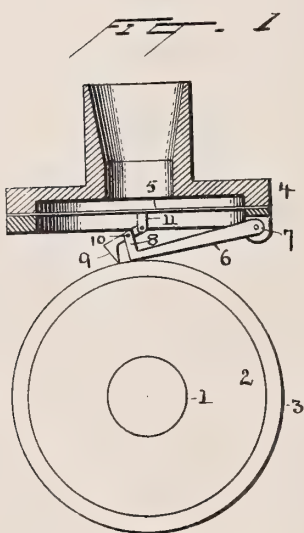
(No Model.)

2 Sheets—Sheet 1.

T. A. EDISON.
PHONOGRAPH.

No. 541,923.

Patented July 2, 1895.



Witnesses
Norris A. Clark.
Nicholas F. Oberli.

Inventor
T. A. Edison.
By his Attorneys
Lyert & Seely.

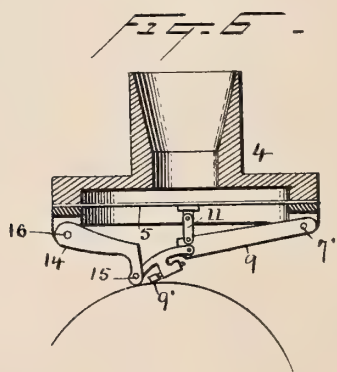
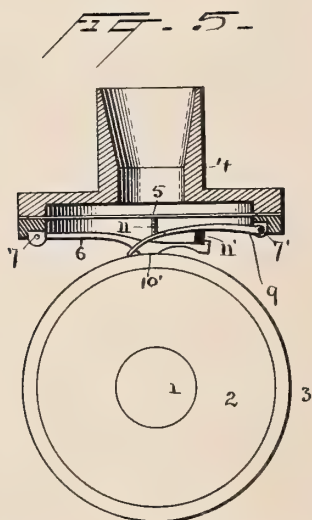
(No Model.)

2 Sheets—Sheet 2.

T. A. EDISON.
PHONOGRAPH.

No. 541,923.

Patented July 2, 1895.



Witnesses
Morris A. Clark.
Nicholas F. Oberly.

Inventor
T. A. Edison
By his Attorneys
Lyert Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 541,923, dated July 2, 1895.

Application filed November 21, 1890. Serial No. 372,223. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 879,) of which the following is a specification.

My invention relates to the recording and reproducing devices of phonographs; and my object is, to enable such devices to work satisfactorily notwithstanding irregularities in the surface of the phonogram blank or recording surface. Sometimes in the manufacture of phonogram blanks, irregularities or eccentricities occur in the formation of the surface, and sometimes the blanks become warped after manufacture, and if provision is not made to prevent it, such irregularities will occasion movements of the recording or reproducing point and the diaphragm which will interfere with the recording or reproducing of the sound. This is obviated by the apparatus hereinafter described and which constitutes the present invention. The apparatus is provided with a presser foot adapted to ride on the surface of the phonogram blank, to which presser foot the operating point (recorder or reproducer) is pivoted or operatively connected.

In the accompanying drawings which illustrate my invention, Figure 1 shows a cross-section of a recorder embodying the improvement. Figs. 2, 3, 4, 5 and 6 are views of modified forms of recorders.

The means for turning the phonogram blank, and for moving the recorder along the phonogram blank are not shown, since they may be of any well known or suitable construction, and are not specifically claimed herein.

It will be understood that a reproducer embodying the present improvement might differ from the recorders illustrated in the shape or size of the operating point.

In the several views, 1 indicates the phonograph shaft, 2 the phonograph cylinder, and 3 the phonogram blank.

4 is a support for the diaphragm 5 and is provided with a mouth piece, or means for connecting a speaking tube.

In Fig. 1, 6 is an arm pivoted at 7, and hav-

ing an angle extension 8. The angle of this lever is adapted to ride on the phonogram blank, as shown, and constitutes the presser foot. The operating point or tool 9 is connected to said angle extension as indicated at 10, and is operatively connected with the diaphragm, at or near its center, at 11, by means of a pivotal or yielding connection.

In Fig. 2, the lever 6 is pivoted as above described, and its free end rides on the phonogram blank. The operating point or tool 9 is pivoted to the presser foot or lever 6 at 10, and is connected to the diaphragm at 11. 12 is a spring pressing lightly against the arm 6.

Fig. 3 is substantially like Fig. 1, except that the form of the presser foot and of the operating point is slightly varied, and this needs no further description, the parts being lettered to correspond with the figures already described.

In Fig. 4, the arm 6, which constitutes the presser foot, is provided with a larger bearing surface than the forms heretofore described. The operating point is pivoted thereto at 10, and is pressed lightly toward the blank by a spring 12', as clearly shown. In this form of apparatus the operating point is not connected directly to the diaphragm, but is connected by means of a dash-pot 13, or other suitable retarding device.

Referring now to Fig. 5, 9 is the operating point or tool (recorder or reproducer) pivoted, in this instance, at or near the edge of the diaphragm at 7'. 11 is a rod or post connecting the recorder or reproducer with the diaphragm, preferably at its center. 6 is a pivoted arm having a surface 10' adapted to ride on the face of the phonogram blank and constitutes the presser foot. Between this arm and the recorder or reproducer is a block or piece, 11', of elastic or yielding material, preferably rubber.

In Fig. 6, 9 is the recorder or reproducer carrying arm pivoted at one side of the diaphragm as shown at 7' and provided with the recorder or reproducer 9'. 14 is an arm connected with the diaphragm supporting ring and terminating adjacent to the phonogram blank as shown. The arm 9 is connected with arm 14 at 15. Said arm 9 is also connected to the diaphragm, preferably by a link 11 by means of which vibrations are transmitted

from the diaphragm to the recorder. As the phonogram blank revolves and eccentricities or irregularities pass under the lower end of arm 14, said arm acts as a presser foot as will be evident.

The presser foot, connected to the operating point as set forth, causes said point to operate substantially independent of eccentricities or irregularities in the surface of the phonogram blank, since when such irregularities pass under and vary the position of the presser foot they simultaneously vary the position of the operating point, as will be evident without further description. The form shown in Fig. 4 has a double provision for obviating the effects of irregularities in the blank, viz: the presser foot and the dash-pot connection with the diaphragm, which connection transmits the rapid vibration due to the sound waves or the sound record but yields to the slower and larger movements due to irregularities in the blank.

Having thus described my invention, what I claim is—

1. The combination of a phonograph diaphragm or vibrating body, a pivoted recorder or reproducer operatively connected to the diaphragm, a presser foot, and a connection between the presser foot and the recorder or reproducer, substantially as described.

2. The combination, in a phonograph, of a diaphragm or vibrating body suitably supported, a phonogram blank or recording surface, a presser foot adapted to bear on said blank, and an operating point pivotally connected to said presser foot and operatively connected to the diaphragm, substantially as described.

3. The combination, in a phonograph, of a diaphragm suitably supported, a phonogram blank or recording surface, a presser foot pivoted to a support and having a bearing on the phonogram blank, and a yielding connection between the operating point and the diaphragm, substantially as described.

4. The combination, of a diaphragm suitably supported, a phonogram blank or recording surface, a presser foot pivoted to a support and having a bearing on the phonogram blank, an operating point, and a retarding device between the diaphragm and operating point, substantially as described.

5. The combination of a phonograph diaphragm, a phonogram blank, a presser foot adapted to rest thereon, a recorder or reproducer pivoted to the presser foot and tending to move toward the blank, and a dash-pot, one member of which is connected to the diaphragm, and one member of which is connected to the recorder or reproducer, substantially as described.

6. The combination with a phonograph diaphragm, a recorder or reproducer operatively connected to the diaphragm, a presser foot, and an elastic or yielding block between the presser foot and the recorder or reproducer, substantially as described.

7. The combination of a phonograph diaphragm, a recorder or reproducer operatively connected to the diaphragm, a presser foot, and a block carried by the presser foot and bearing against the recorder or reproducer, substantially as described.

8. The combination of a phonograph diaphragm, a phonogram blank, a pivoted recorder or reproducer, an operating connection between the diaphragm and recorder or reproducer, and a pivoted presser foot adapted to rest on the phonogram blank, and a block between the recorder or reproducer, and the presser foot adapted to communicate motion from one to the other, substantially as described.

9. The combination, in a phonograph having a phonogram blank, with a phonograph diaphragm, of a presser foot connected to said diaphragm and resting on the surface of the phonogram blank, a recorder, and a recorder carrying arm one end of which is pivoted and one end of which is connected to said presser foot, substantially as described.

10. The combination of a phonograph diaphragm and support pivoted on one side, the presser foot extending from the opposite side, a recorder or reproducer connected to said presser foot and to the diaphragm, substantially as described.

This specification signed and witnessed this 27th day of October, 1890.

THOS. A. EDISON.

Witnesses:

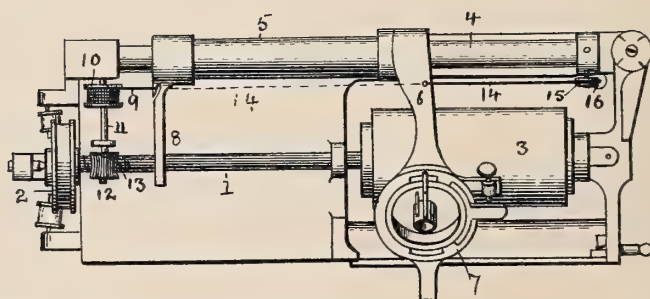
CHARLES M. CATLIN,
RICH'D. N. DYER.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 541,924.

Patented July 2, 1895



Witnesses
Norris A. Clark.
Nicholas F. Oberle

Inventor
T. A. Edison
By his Attorneys
Syer & Selby.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 541,924, dated July 2, 1895.

Application filed December 3, 1890. Serial No. 373,410. (No model.)

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 893,) of which the following is a specification.

My invention relates to feeding devices for phonograph recorders or reproducers, that is, to devices for moving said recorders or reproducers slowly along over the phonogram blank, at the same time that the blank revolves. The ordinary way to accomplish this is by means of a screw shaft, equal in length to the phonogram blank, and connected to the recorder or reproducer by means of a suitable nut and arm. This arrangement is simple and efficient, but is somewhat objectionable owing to the large expense of a screw shaft of the length, and fineness of thread required, viz., one-hundred or more threads to the inch.

The object of the present improvement is to provide novel means for the purpose above mentioned, and the invention consists in the apparatus hereinafter described and claimed.

The accompanying drawing illustrates in plan so much of a phonograph as is necessary to make the improvement clear.

1 is a phonograph shaft, which may be provided with the pulley 2, by means of which the shaft may be driven in the usual manner.

3 is the phonogram blank or recording surface.

4 is a rod, called the guide rod, supported in suitable posts or bearings, and on this rod slides a sleeve 5, which carries the arm 6, at the end of which the recorder and reproducer 7 are held.

8 is an arm corresponding in position to the feed arm in my old form of phonograph. To this arm is attached a fine steel wire 9 (or a cord or other filament generically included in the term "wire" as hereafter used herein), which wire is wound on a drum or reel 10, supported on the shaft 11. This shaft is provided with a worm wheel 12, which engages with a worm screw 13 on the shaft 1. To the arm 8, or to some other part of the sliding carrier, is attached a second wire or cord 14 which passes over a pulley 15, suitably lo-

cated, and is connected to a weight or other motor 16.

The apparatus thus described is used in the following manner: The arm 8 and connected parts being at their extreme position toward the left the phonogram is turned by means of the pulley 2 and a suitable motor. At the same time the worm wheel 12 is turned in a direction—and at a speed to slowly uncoil the wire 9 from its reel, and the weight 16 pulls the carriage and the recorder lengthwise of the blank. By these two movements, viz., the rotary movement of the blank, and the longitudinal movement of the recorder, the usual spiral track is made on the blank, it being understood that the operator speaks against the recorder diaphragm at the same time that the phonograph is moving as above described.

I do not confine myself to the exact arrangement shown and described, since it is possible to vary the apparatus in some particulars without departing from the invention. It would not be impossible to draw the carriage and recorder along by winding the wire 9 upon the reel, instead of unwinding it and providing a weight to draw the carriage.

Having thus described the improvement, what I claim is—

1. The combination of a phonograph recorder or reproducer, a drum, a wire on the drum and connected to the recorder or reproducer, and means for turning the drum at a speed corresponding to the speed desired for the recorder or reproducer, substantially as described.

2. The combination with a phonograph shaft, a recorder or reproducer and supporting device therefor, of a drum, a wire thereon and connected with the supporting device, and a gearing between the phonograph shaft and drum, substantially as described.

3. The combination with a phonograph shaft, a recorder or reproducer and supporting device therefor, of a drum, a wire thereon and connected with the supporting device, a gearing between the phonograph shaft and drum, and means for moving the recorder and reproducer as the wire is unwound from the drum, substantially as described.

4. The combination of a phonogram blank and means for moving the same, a drum

driven with the blank, a wire wound on the drum, a movable recorder or reproducer to which the wire is connected, and means for moving the recorder or reproducer as the wire is unwound from the drum, substantially as described.

5. The combination of a phonograph shaft, a recorder or reproducer, a supporting arm and sleeve, a guide rod on which the sleeve is movable, a drum, a wire on the drum, and connected with the recorder or reproducer, and a connection between said drum and phonograph shaft, substantially as described.

6. The combination of a phonograph shaft,

a recorder or reproducer, a supporting arm and sleeve, a guide rod on which the sleeve is movable, a drum, a wire on the drum, and connected with the recorder, or reproducer, a connection between said drum and phonograph shaft, and a weight or other motor tending to move the recorder or reproducer in one direction, substantially as described.

This specification signed and witnessed this 17th day of November, 1890.

THOS. A. EDISON.

Witnesses:

HARRY F. MILLER,

THOMAS MAGUIRE.

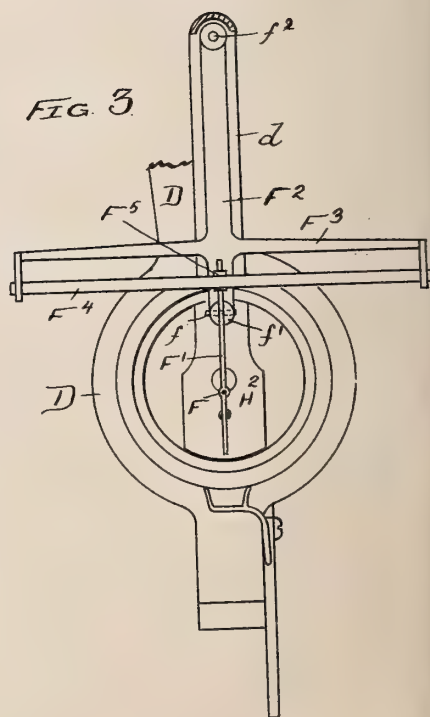
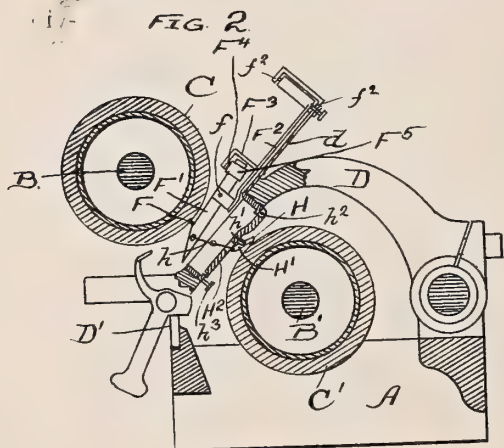
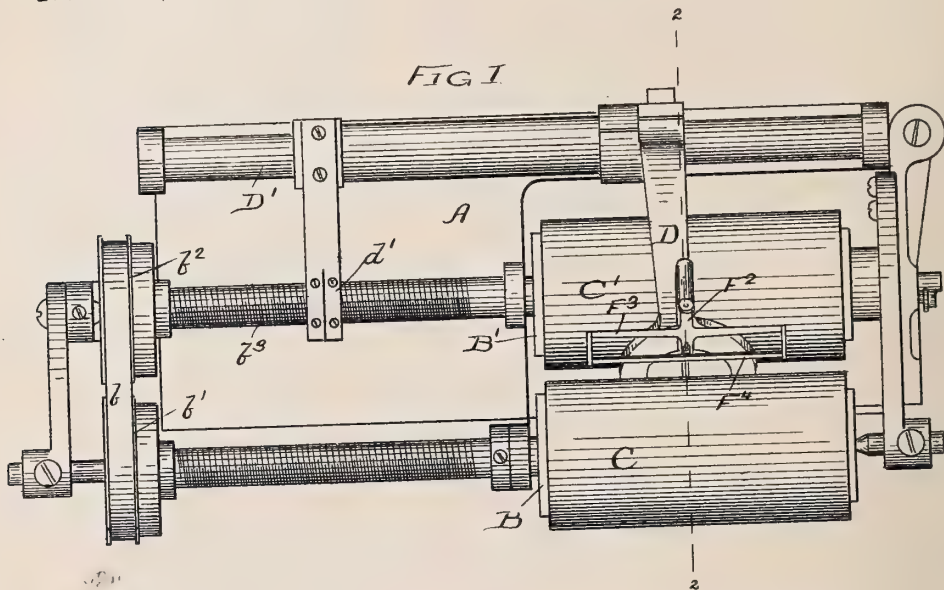
(No Model.)

E. H. AMET.

APPARATUS FOR REPRODUCING PHONOGRAMS.

No. 545,439.

Patented Sept. 3, 1895.



WITNESSES:

Sav. C. Curtis
A. W. Munday,

INVENTOR:
EDWARD H. AMES

By Monday, Warts & Adcock.

HIS ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF WAUKEGAN, ASSIGNOR TO CHARLES DICKINSON,
OF CHICAGO, ILLINOIS.

APPARATUS FOR REPRODUCING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 545,439, dated September 3, 1895.

Application filed June 7, 1895. Serial No. 551,984. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing in Waukegan, in the county of Lake and State of Illinois, have invented a new and useful Improvement in Apparatus for Reproducing Phonograms, of which the following is a specification.

My invention relates to machines for copying or reproducing phonogram or sound writings on wax or other cylinders.

The object of my invention is to provide a machine of a simple and durable construction by means of which phonograms on wax or other cylinders may be accurately and perfectly reproduced on other like cylinders and without any disagreeable modifications in sound or tone due to the action of the mechanism.

In my invention the reproducing or following stylus is secured to or carried by a lever having a direct link or mechanical connection with the lever carrying the recording or engraving stylus, and a light flexible diaphragm-like-acting spring is employed to press against the opposite end of the lever carrying the reproducing or following stylus, and a rubber cushion is inserted between the lever and this flat spring, by which means I find that the engraving-stylus is caused to copy or reproduce very accurately and perfectly the original phonogram, so that the copy cannot be distinguished from the original when placed in a graphophone.

My invention consists in the novel construction of parts and devices and in the novel combinations of parts and devices herein shown and described and specified in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is a detail plan view of the mechanism carrying and connecting the reproducing-stylus and the engraving-stylus.

Similar letters of reference indicate like parts in all the figures of the drawings.

In the drawings, A represents the frame of the machine; B and B', the revolving shafts or holders for holding and revolving synchronously the original phonogram-cylinder C and

the similar cylinder C', upon which the copy is to be made.

D is the traveling head frame or slide, upon which the reproducing or following stylus F and the recording or engraving stylus H are both mounted and carried from end to end of the two cylinders.

The reproducing or following stylus F is secured to a vertically or radially vibrating lever F', which is pivoted at f to a stud f' , secured to a laterally-vibrating lever F², that is pivoted, by pivot-bearings ff^2f^2 , to an arm d , attached to the traveling frame or slide D. Attached to the laterally vibrating lever F² is a yoke F³, between the arms of which extends a flat diaphragm-like-acting spring F⁴, that bears against the outer or free end of the stylus-carrying lever F'. Interposed between this spring F⁴ and the stylus-lever F' is a rubber or elastic cushion F⁵, which serves to prevent or to aid in preventing the communication of any harsh strident or disagreeable action to the engraving-stylus H. The flat spring F⁴ has a bearing at each end against the yoke F³ and presses at its middle against the stylus-lever F'. It thus serves not only to hold the stylus yieldingly against the phonogram-cylinder C, but by reason of its diaphragm-like form and action causes the lever F' to very faithfully copy the movement and action of the stylus-carrying lever of a phonograph, and as the movement and action of this stylus-carrying lever F' are communicated to the lever H', carrying the engraving-stylus H, a very accurate and perfect copy is produced upon the cylinder C'. The stylus F' is connected to the engraving-stylus lever H' by a link or links h , preferably of wire. The lever H' is pivoted at h' to a pivoted arm H², which itself is pivoted at h^2 to the traveling frame or slide D. At the free end of the pivoted arm or lever H² is an adjustable stop h^3 to limit the movement of said arm H².

The two shafts B B' are rotated synchronously by a belt b on the pulleys $b'b^2$. The traveling frame or slide D is fed or reciprocated by a feeding-screw b^3 on the shaft B' engaging a threaded nut or arm d' , secured to the head or frame D. The frame or slide D travels back and forth on a suitable guide D'. The spring F⁴ is soldered or secured rigidly at one

end to one arm of the yoke F^3 and simply pressed against the other arm of the yoke without being secured or attached thereto.

I claim—

5 1. In a machine for copying and reproducing phonograms, the combination with a reproducing stylus secured to a vertically vibrating lever, a laterally vibrating lever upon which said first mentioned lever is mounted,
10 a yoke on said laterally vibrating lever, a spring extending between and bearing against the arms of said yoke and also against said stylus carrying lever, substantially as specified.

15 2. In a machine for copying and reproducing phonograms, the combination with a reproducing stylus secured to a vertically vibrating lever, a laterally vibrating lever upon which said first mentioned lever is mounted,
20 a yoke on said laterally vibrating lever, a spring extending between and bearing against the arms of said yoke and also against said stylus carrying lever, and a cushion between said spring and stylus carrying lever, substantially as specified.

25 3. In a machine for copying and reproducing phonograms, the combination with a reproducing stylus secured to a vertically vibrating lever, a laterally vibrating lever upon which said first mentioned lever is mounted,
30 a yoke on said laterally vibrating lever, a spring extending between and bearing against the arms of said yoke and also against said stylus carrying lever, an engraving stylus, a lever carrying the same and means for connecting said engraving stylus carrying lever with said reproducing stylus carrying lever,
35 substantially as specified.

4. In a machine for copying and reproducing phonograms, the combination with a reproducing stylus secured to a vertically vibrating lever, a laterally vibrating lever upon which said first mentioned lever is mounted, a yoke on said laterally vibrating lever, a spring extending between and bearing against the arms of said yoke and also against said stylus carrying lever, and a cushion between said spring and stylus carrying lever, an engraving stylus, a lever carrying the same and means for connecting said engraving stylus carrying lever with said reproducing stylus carrying lever, substantially as specified.

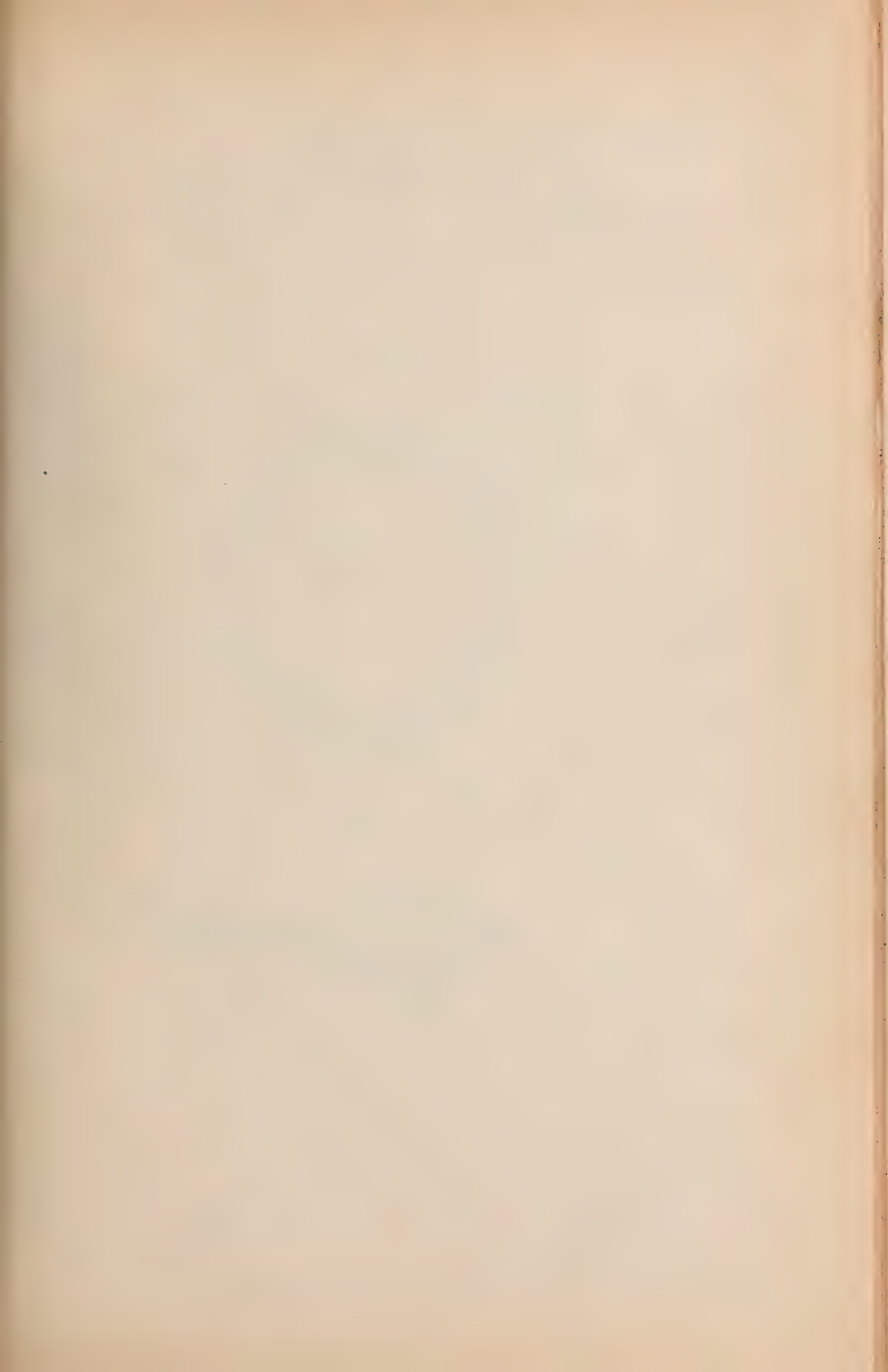
5. In a machine for copying or reproducing phonograms, the combination with a reproducing stylus F , a lever F' on which it is mounted, a flat spring F^4 supported at both ends and bearing at its middle against said lever F' , an engraving stylus H , a lever H' on which it is mounted, and a connection between said levers F' and H' , substantially as specified.

6. In a machine for copying or reproducing phonograms, the combination with a reproducing stylus F , a lever F' on which it is mounted, a flat spring F^4 supported at both ends and bearing at its middle against said lever F' , an engraving stylus H , a lever H' on which it is mounted, and a connection between said levers F' and H' , and a rubber cushion F^5 between said lever F' and spring F^4 , substantially as specified.

EDWARD H. AMET.

Witnesses:

EDMUND ADCOCK,
H. M. MUNDAY.



(No Model.)

E. BERLINER.

SOUND RECORD AND METHOD OF MAKING SAME.

No. 548,623.

Patented Oct. 29, 1895.

Fig. 1.

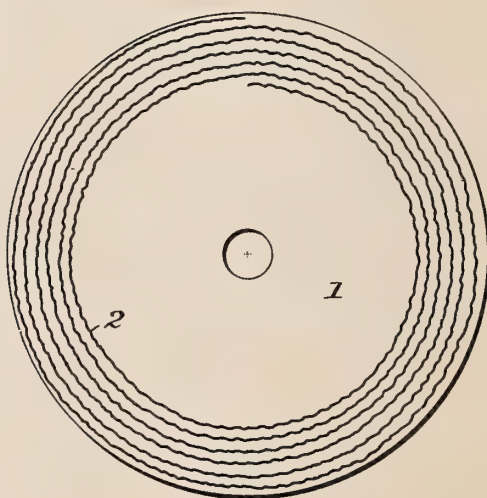
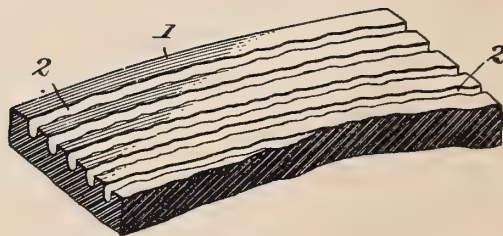


Fig. 2.



Witnesses
Prof. Hinkel
P. J. Chapman

Inventor,
Emile Berliner,
By *Joseph Lyons*,
Attorney

It is hereby certified that in Letters Patent No. 548,623, granted October 29, 1895. upon the application of Emile Berliner, of Washington, District of Columbia, for an improvement in "Sound-Records and Methods of Making Same," an error appears in the printed specification requiring correction, viz: In line 50, page 1, the word "cast" should read *coat*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

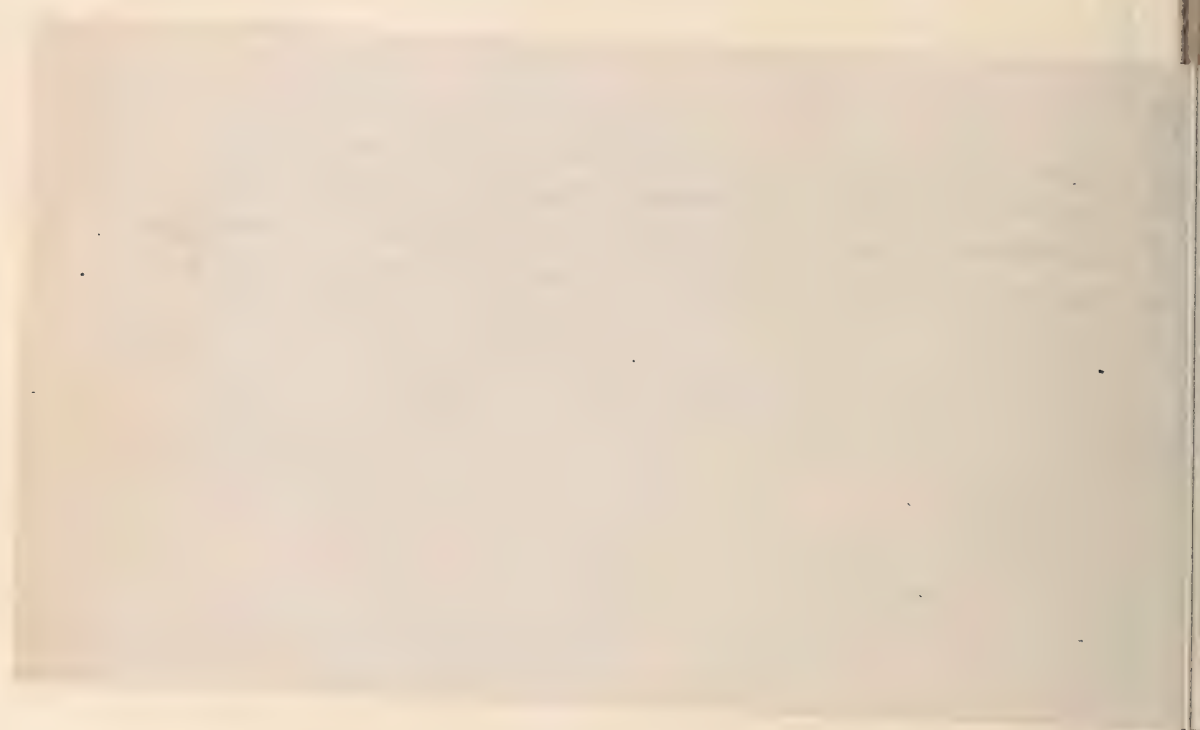
Signed, countersigned, and sealed this 26th day of November, A. D. 1895.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.



UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA.

SOUND-RECORD AND METHOD OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 548,623, dated October 29, 1895.

Application filed March 18, 1893. Serial No. 466,708. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Processes of Making Copies of Sound-Records; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in sound-records and in the method of making the same.

The present invention relates more particularly to the production of copies or duplicates of the flat sound-records as made by gramophone in the manner set forth in Letters Patent granted to me on November 8, 1887, No. 372,786, and on May 15, 1888, No. 382,790.

The sound-records, as is well-known, consists of undulatory grooves of even depth, as distinguished from non-undulatory grooves of varying depth produced by other methods of recording sounds.

The sound-records of the gramophone are generally zinc disks into which a spiral record of sound-waves is etched. Other substances than zinc capable of being etched into may of course be used.

The simplest way for making a duplicate copy of such a record is to impress it in wax, deposit copper thereon, and detach the copper shell. This is the well-known method used by electrotypers. There is, however, a loss in the perfection of the surface, resulting from the fact that electrotypers' wax is porous and uneven of surface, and the resultant copper copy containing the sound-record is not as good in tone quality as the original. It is therefore necessary to deposit a copper or other metallic matrix directly on the original zinc record. This I do by first thinly covering the zinc with a material capable of resisting the action of the sulphate of copper solution usually employed for electroplating or typing, and then deposit copper over that, and when thick enough detach the copper deposit.

My method is to cast the previously-cleaned zinc-record disk in a cyanide-of-copper or cyanide-of-brass solution, electrolytically, by

which a very thin film of copper or brass adheres to the zinc. After being thus prepared, the coated zinc disk is placed into a sulphate-of-copper bath and copper deposited on it electrolytically. The deposit when thick enough is then detached and forms an accurate matrix, showing the sound-record of the zinc disk in reverse. This matrix can then be impressed into suitable material and thereby produce exact duplicates of the original record-sheet.

I have found hard rubber and celluloid to be excellent materials from which to make such duplicates. These substances when heated become very soft, and when in this soft state they are impressed with a matrix, such as above described, and are cooled while still under pressure, and the resultant rubber or celluloid sheet retains all the characters of the matrix, and thus forms a copy record of the original zinc disk. In impressing a copper matrix on softened rubber, however, the sulphur fumes which are generated when heating the rubber attack the copper and destroy the smoothness of its surface. I have therefore found it necessary to coat the copper matrix with a substance capable of withstanding the sulphur fumes, and I find electrolytically-deposited iron or nickel a proper substance to accomplish the desired effect. The copper matrix is therefore cleaned and placed in a nickel or iron bath, and a thin coating of iron or nickel is deposited on it by an electric current. The matrix thereby becomes protected against sulphur fumes, and iron and nickel being harder than copper the matrix, by being thus coated, becomes more durable, and withstands pressure for a longer period. It is also possible with such a matrix to press unvulcanized rubber into it, vulcanize the rubber while attached to the matrix, and then detach it, when a true copy of the original sound-disk will be the result.

In the annexed drawings, forming part of this specification, there is shown in Figure 1 a plan view of a sound-record made in accordance with the present invention, with the lines representing the record greatly exaggerated; and Fig. 2 is a perspective view of a small portion of a sound-record copy on an enlarged scale.

Referring to the drawings, there is shown a

disk 1, of hard rubber or like material, having in its face an undulatory spiral groove 2 of even depth representing sound-waves.

What I claim is—

5 1. The process of duplicating flat sound records, which consists in depositing copper or other like metal on an original record, then detaching the copper reverse thus produced and facing the same with a layer of hard
10 metal which is not attacked by sulphur, and then pressing the reverse into temporarily softened hard rubber, substantially as described.

15 2. The process of duplicating flat sound records, which consists in facing an electro-deposited reverse of a record, with nickel or iron, and then pressing this reverse into hard rubber, substantially as described.

3. As an article of manufacture, a sheet of hard rubber having upon its face an undulatory groove of even depth representing sound waves, substantially as described. 20

4. As an article of manufacture, a sheet of hard rubber having pressed into its face an undulatory line of even depth representing
25 sound waves, substantially as described.

5. A copy of a flat sound record, which consists of a disk of hard rubber having impressed upon its face the lines representing the record, substantially as described. 30

In testimony whereof I have affixed my signature in presence of two witnesses.

EMILE BERLINER.

Witnesses:

S. E. YOUNG,

GEORGE SEIDENSPIMER.



(No Model.)

T. H. MACDONALD.

DEVICE OR APPARATUS FOR DUPLICATING GRAPHOPHONE RECORDS.

No. 559,806.

Patented May 12, 1896.

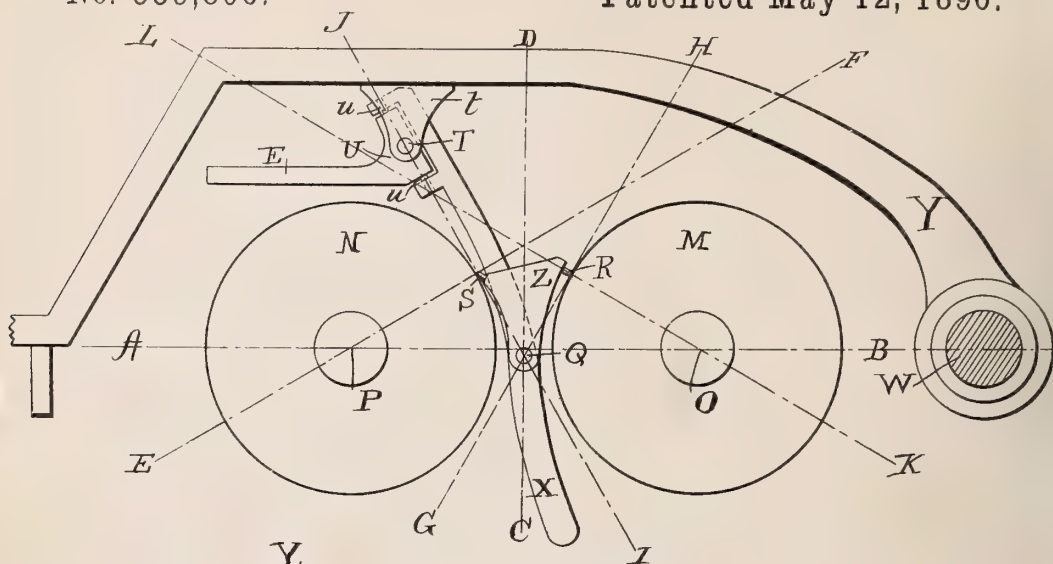


Fig. 1.

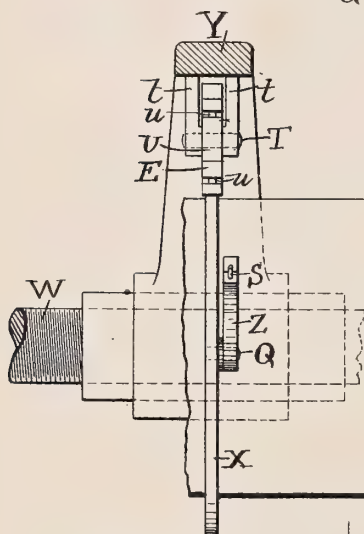


Fig. 2.

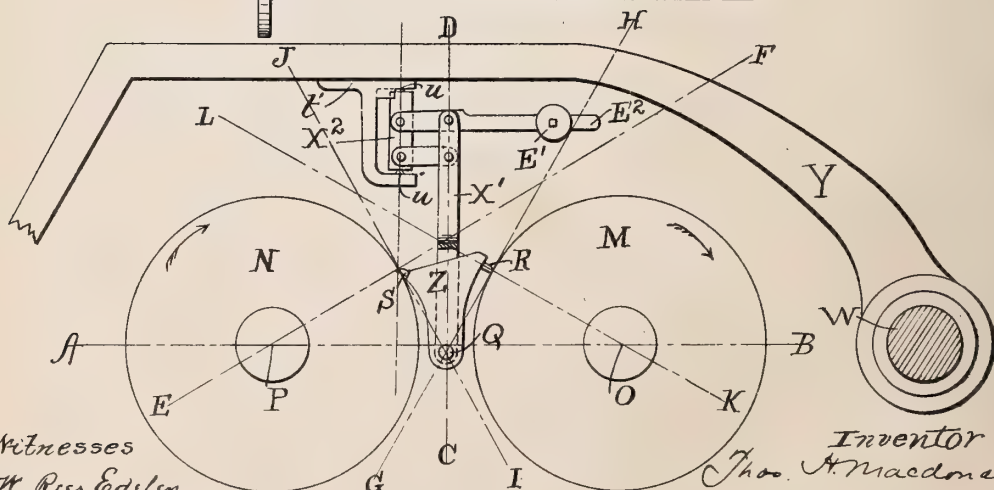


Fig. 3.

Witnesses

H. Rice Edson.

James H. Rice

Inventor

Thos. H. Macdonald

G. Salasman
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

DEVICE OR APPARATUS FOR DUPLICATING GRAPHOPHONE-RECORDS.

SPECIFICATION forming part of Letters Patent No. 559,806, dated May 12, 1896.

Application filed December 4, 1895. Serial No. 571,083. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Devices or Apparatus for Duplicating Graphophone-Records, which is fully set forth in the following specification.

This invention has reference to devices or apparatus for duplicating graphophonic records. In such apparatus as heretofore constructed the reproducing and recording styles have usually been carried by separate levers connected by suitable intermediate links, diaphragms, &c., the pressure requisite to cut the duplicate record being transmitted through the pivot-points of the levers by suitable weights or other equivalent means. Such devices not only require very painstaking adjustment, but owing to their delicacy of structure are very susceptible to injury.

The object of my present invention is to provide a much simplified construction of a substantial character and which will duplicate records with greater precision than the duplicating devices heretofore in use. In accordance therewith the reproducing and recording styles are rigidly connected, both being carried by a lever to which vibratory movements are imparted by the master record and whereby the reproducing-style is caused to cut in a blank a duplicate corresponding to the master record. This lever is pivoted to an arm, which is arranged (at an inclination or otherwise) so that the weight thereof falls upon the point of pivot to hold the styles in contact with their respective cylinders. Said arm, which may for distinction be called the "pressure-arm," is pivoted at one end to swing therefrom and is also swiveled, permitting movement about a longitudinal axis. The pressure exerted by the pressure-arm may and is preferably counteracted to some extent by a weight operating from the pivot-point of said arm, thus permitting the latter to be made much heavier and more substantial and giving it greater inertia than would otherwise be permissible with a device of this general construction. As the blank cylinder revolves against the cutting-point of the recorder a groove is cut in its surface exactly corresponding to that of the master record,

the reproducing-point following and accurately transmitting to the recorder the movements due to variations in the depth of cut of the master record. The recording-point is in the line of the axis on which the pressure-arm is swiveled longitudinally, so that the reproducing-point can find its adjustment accurately without disturbing the position of the recorder.

Details of arrangement and what is considered the best embodiment of my invention in an operative machine will be clearly understood by reference to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a cross-section of an apparatus embodying the invention; Fig. 2, an elevation, partly in section; and Fig. 3, a view similar to Fig. 1, illustrating another form of apparatus embodying the invention.

Referring to Figs. 1 and 2, Y represents a traveling supporting-arm engaging a feed-screw W at one end and sliding on a rail V at its other end. M is the master-record cylinder, and N the blank cylinder for receiving the duplicate, said cylinders being horizontally arranged parallel to each other and carried by suitable mandrels connected with and driven at the same speed by suitable mechanism in a well-known manner. Z is a lever carrying the reproducing-point R and the recording-point S. This lever is pivoted at Q to pressure-lever X, arranged at an inclination and swiveled upon the pins *u u*, projecting into sockets in a block U to turn about a longitudinal axis. The block U, carrying a weighted arm E, counteracting to some extent the pressure exerted by the lever X upon the points R and S, is pivoted at T to a bifurcated bracket *t*, depending from the arm Y. The weighted lever or pressure-arm X is thus pivoted at T to swing in a plane at right angles to the axis of the record-cylinders and on the points *u* to oscillate slightly on an axis tangent to cylinder N.

To state with geometrical precision that relation and arrangement of the parts which has in actual practice been found to produce the best results, but to which the invention is not limited, it is preferable to locate the pivot-point Q of lever Z at the intersection

of two corresponding tangent lines I J and G H, said point of intersection being near a horizontal line A B, projected through the axes O and P of the cylinders M and N, while the recording and reproducing points S and R bear against the cylinders at the respective tangent points of the said lines I J and G H. The swivel-pins *u u* are also in the tangent line I J in which the recording-point is located, so that the oscillating movement of the arm X is about the line I J as an axis. Consequently the reproducing-point R can find a lateral adjustment without affecting the position of the recording-point S. It will be noted that the pivot-points T and Q and the swivel-points *u u* are all in line with the recording-point S, the object of this disposition being to prevent distortion.

From the foregoing description it will be understood that the weight of arm X, swinging from pivot-point T and acting upon fulcrum Q of lever Z, supplies the pressure in the direction of line C D for holding the points R and S in contact with the cylinders M and N, which pressure it is found desirable for the reasons indicated to counteract to some extent by the weight E. Thus as the cylinders rotate in the direction of the arrows the variations in depth of the master record cause the point R to move in the direction of the radial line L K of cylinder M, vibrating the lever Z on the pivot-Q, and in turn imparting movements to the point S in the direction of the radial line E F of cylinder N, and thereby causing it to cut a record in the blank N exactly corresponding to the master record.

Referring now to Fig. 3, the lever or support Z for the recording and reproducing points is, as before, pivoted at Q to a pressure-arm X', the point Q being at the intersection of the two tangent lines I J and G H, drawn from the respective points of contact of the recorder and reproducer with cylinders M N. Arm or lever X' is depressed by the counterweight E', adjustable on lever E². In order to secure parallelism of movement of lever X', it is made part of a pantograph system, the parallel arm X² being swiveled at points *u u* in the bracket *t'*, so as to permit a slight oscillation, as in the arrangement shown in Fig. 1. This axis of oscillation is in a line which intersects recording-point S. The operation of the apparatus shown in Fig. 3 is substantially as already described with reference to Figs. 1 and 2.

The disposition and arrangement of the several parts have been described with minuteness of detail for the purpose of exhibiting the invention in the best practical forms known to me.

It will be obvious to skilled mechanics that these details may be varied within wide limits without departing from the spirit of the invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A device for duplicating graphophone-records comprising, in combination, a lever mounted to vibrate between a master record and a blank, a reproducing and a recording style carried by said lever, and means for applying pressure to the lever whereby said styles are respectively maintained in contact with the master record and blank, substantially as described.

2. A duplicating apparatus comprising, in combination, a support mounted to vibrate between a master record and a blank, a reproducing and a recording style secured rigidly to said support, and a pivoted pressure-arm carrying the fulcrum of the support and holding the styles with yielding pressure respectively in contact with the master record and blank, substantially as described.

3. In a graphophonic duplicating device, the combination with a suitable support, of a lever carrying the reproducing and recording styles, said lever being mounted to have a vibratory movement between a master record and a blank, and an oscillatory movement on an axis intersecting the point of the recording-style, substantially as described.

4. In a duplicating device, the combination with a supporting-arm, of a lever carrying the reproducing and recording styles and mounted to vibrate between the master record and blank, a pressure-arm pivotally supported from said supporting-arm, carrying the fulcrum of said lever, and swiveled to oscillate slightly about a longitudinal axis, substantially as described.

5. A duplicating apparatus comprising in combination a lever carrying the reproducing and recording styles, and mounted to vibrate between the master record and blank, and a pivotally-supported weighted arm carrying the fulcrum of the lever and swiveled to oscillate about a longitudinal axis passing through the recording-style and the fulcrum of the lever, substantially as described.

6. In a duplicating apparatus, the combination of a lever carrying the reproducing and the recording styles and mounted to vibrate between the master record and blank, a pivoted weighted arm carrying the fulcrum of said lever, and means for partially counteracting the weight of said arm, substantially as described.

7. In a duplicating apparatus, the combination with a supporting-arm, of a pivoted lever carrying the reproducing and recording styles and mounted to vibrate between the master record and the blank, a block pivotally connected to said supporting-arm, a weighted pressure-arm swiveled to said block and carrying the pivot of the lever, and a weighted arm on the block acting to partially counteract the pressure of the arm, substantially as described.

8. In a duplicating apparatus, the combination of the weighted pressure-arm, a lever fulcrumed thereon between the master record and blank, a reproducing-point and a record-

ing-point pressed by the weight of said arm into contact with the said master record and blank, respectively, the fulcrum of said lever being at the intersection of tangent lines drawn respectively from the points of the recorder and reproducer, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

G. L. HUBBELL,

CLEMENT MARCH.



(No Model.)

T. H. MACDONALD.
BOX FASTENER.

No. 562,137.

Patented June 16, 1896.

Fig. 1.

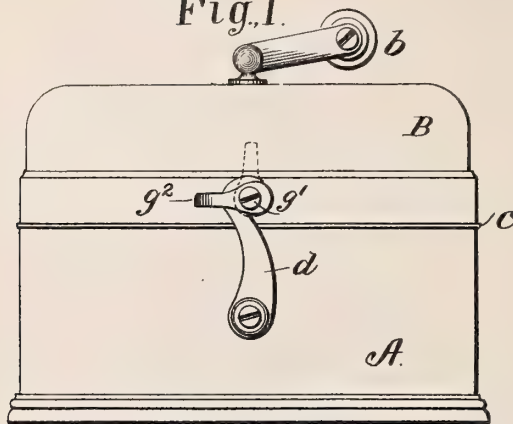


Fig. 2.

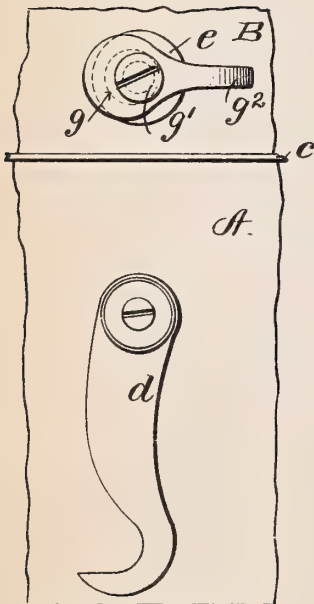


Fig. 3.

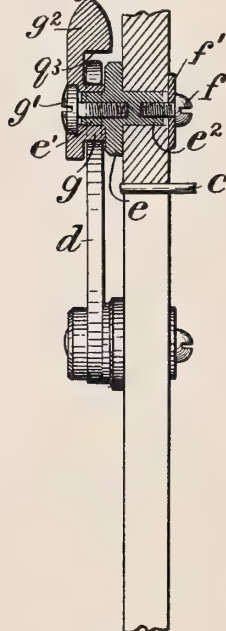


Fig. 4.

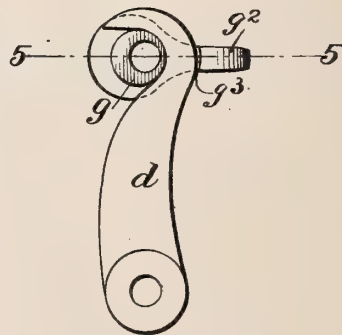


Fig. 5.

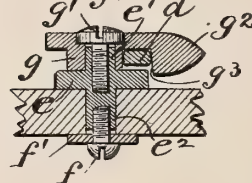
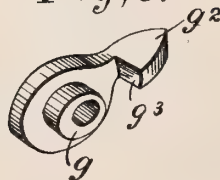


Fig. 6.



Witnesses.
W. R. Edison,
Jesse Davis

Inventor.
Thomas H. Macdonald
by Joseph Mauro,
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE
AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

BOX-FASTENER.

SPECIFICATION forming part of Letters Patent No. 562,137, dated June 16, 1896.

Application filed November 2, 1895. Serial No. 567,727. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Clasps or Locks, which are fully set forth in the following specification.

This invention has reference to clasps or locks, and particularly to such as are useful in securing the cover or removable part of a casing to the base, in connection with machines or apparatus, such as graphophones, type-writers, &c. Such machines are usually mounted or rest upon the base of an inclosing casing and are adapted to be carried or lifted about by a handle on the cover, the latter being secured to the base by suitable devices or latches. That such devices shall effect a tight closure with facility and security against accidental displacement, which would probably result in damage to the machine, are the objects in view. According to my present invention such objects are attained by a clasp or device of simple construction, comprising two members, a hook and a rotatable eccentric having a manipulating and locking arm, said parts being located respectively on the cover and base of the casing. The parts are so disposed that when the hook is thrown over the eccentric and the latter rotated, by means of the arm, it operates to draw the cover tightly down against the base, the arm at the same time being moved to a position such that a projection thereon engages behind the hook and, so long as the parts remain in this position, prevents its disengagement from the eccentric. Upon moving the arm in a reverse direction, however, the eccentric operates to automatically disengage the hook therefrom.

In the accompanying drawings, illustrating my invention, Figure 1 is an end elevation showing my invention applied to an inclosing casing. Fig. 2 is a similar but enlarged view showing the parts of the clasp disengaged. Fig. 3 is a view partly in section and partly in elevation; and Fig. 4 is an inside view of the latch, as shown in Fig. 1. Fig. 5 is a section on line 5 5 of Fig. 4, and Fig. 6 is a detail of the eccentric.

Referring to the drawings, A represents the base, and B the top or cover, of an inclosing casing, the cover being provided with a handle *b*.

c is a plate for supporting the machine—say a graphophone—in the base A.

d is a hook pivotally mounted on the base, so as to swing clear thereof.

On the cover B is a plate *e*, having oppositely-extending stems *e'* *e''*, the latter projecting into an opening in the cover. A screw *f*, engaging a threaded opening in stem *e''*, and a washer *f'* secure plate *e* to the cover. Stem *e'* serves as a bearing for the eccentric *g*, which is sleeved thereon and held in place by a screw *g'*. The eccentric carries or is attached to an arm *g''*, formed with a shoulder or projection *g'''*, whereby it can be rotated to the desired position and the hook locked in engagement therewith.

In operation the hook may be freely engaged with the eccentric when the latter is turned to the position shown in Fig. 3 and in dotted lines, Fig. 1. After this has been effected, the eccentric is rotated by means of arm *g''* to the position shown in full lines in Fig. 1, throwing the swell of the eccentric against the hook, drawing the cover B tightly down on the base A, and also bringing the shoulder or projection *g'''* to a position behind the hook, whereby it prevents accidental disengagement of the hook and eccentric.

To disengage the parts, the eccentric is rotated in a reverse direction to that above described, its action causing the automatic release of the hook.

What I claim as new, and desire to secure by Letters Patent, is—

In a clasp or lock, the combination with a pivoted hook, of a rotatable eccentric with which said hook engages, said eccentric being mounted to rotate and the hook to swing in the same plane, an arm on the eccentric and a shoulder or projection on the arm adapted to engage behind and lock the hook into engagement with the eccentric, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

CLEMENT MARCH,
G. L. HUBBELL.





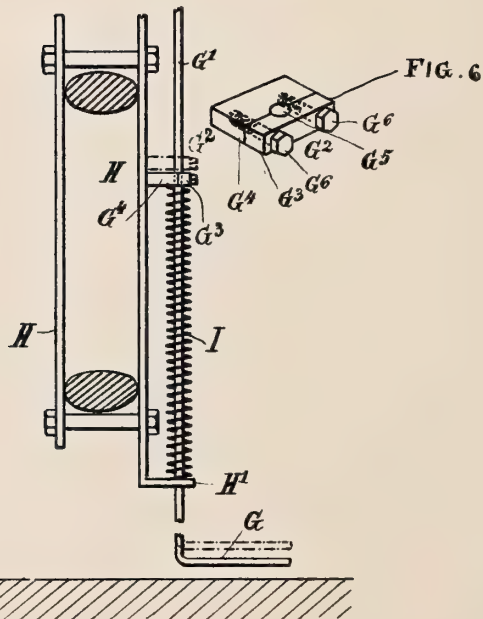
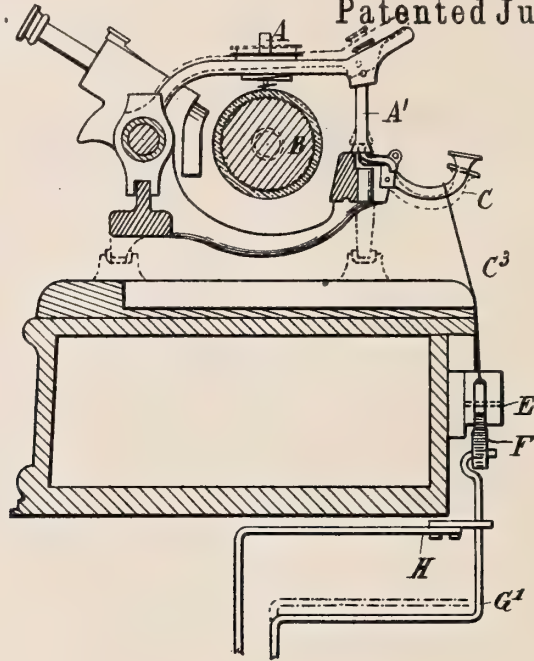
L. S. ROBINSON.

PEDAL APPARATUS FOR CONTROLLING RECORDING AND
REPRODUCING APPARATUS OF PHONOGRAPHS.

No. 562,664.

Patented June 23, 1896.

FIG. 1.



Witnesses:

Thomas Durant
J. M. Fowler Jr

Inventor:

Lucie S. Robinson,
by *Chas. S. Chas.*
his Attys.

L. S. ROBINSON.

PEDAL APPARATUS FOR CONTROLLING RECORDING AND
REPRODUCING APPARATUS OF PHONOGRAPHS.

No. 562,664.

Patented June 23, 1896

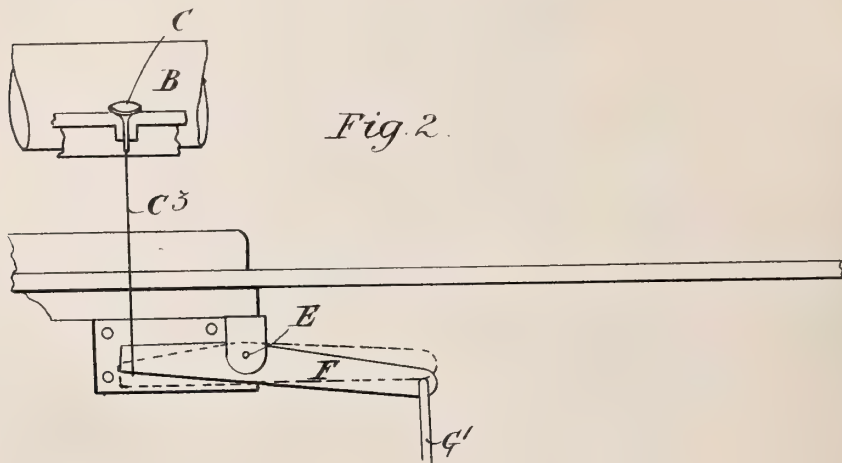


Fig. 2.

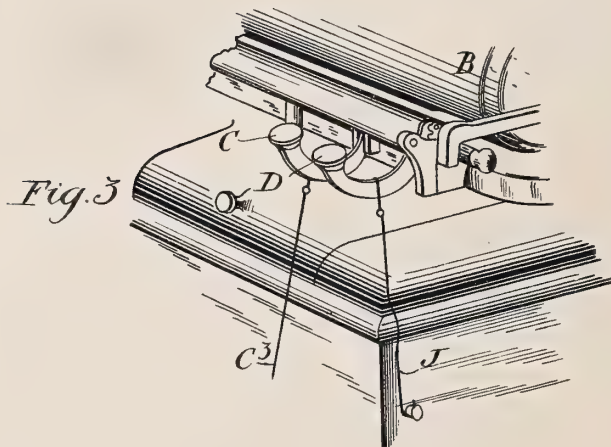


Fig. 3.

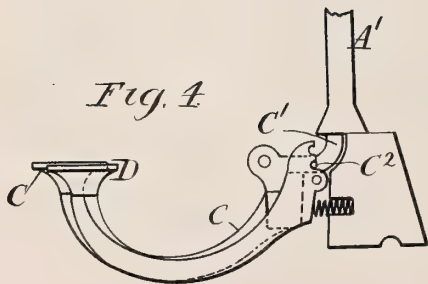


Fig. 4.

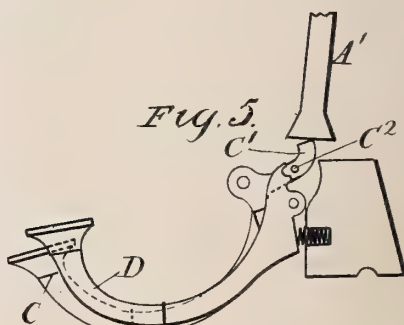


Fig. 5.

Witnesses:
Thomas Durant
J. M. Bowley

Inventor:
Lester S. Robinson
by *Chas. S. Smith*
his Attorney

UNITED STATES PATENT OFFICE.

LESLIE STEPHEN ROBINSON, OF LONDON, ENGLAND,

PEDAL APPARATUS FOR CONTROLLING RECORDING AND REPRODUCING APPARATUS OF PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 562,664, dated June 23, 1896.

Application filed November 4, 1895. Serial No. 567,895. (No model.) Patented in England December 18, 1894, No. 24,588.

To all whom it may concern:

Be it known that I, LESLIE STEPHEN ROBINSON, a subject of the Queen of England, residing at London, England, have invented certain new and useful Improved Pedal Apparatus for Controlling the Recording and Reproducing Apparatus of Phonographs, (for which I have obtained Letters Patent in Great Britain, No. 24,588, dated December 18, 1894,) of which the following is a specification.

This invention relates to improved pedal apparatus for controlling the recording and reproducing apparatus of phonographs.

According to my invention I combine with a pedal which when controlled by the foot or otherwise renders the phonograph or the like operative, an automatic device to render the instrument inoperative when such control ceases. With such apparatus the user of the instrument has his hands free, for handling documents, for instance, and, moreover, on releasing the pedal he raises the needle clear of the record-cylinder, but leaves everything in readiness for instant operation, which recommences immediately upon depression of the pedal, whereby the needle is restored to the acting position.

In the accompanying drawings, Figure 1 is a vertical section showing apparatus constructed according to my invention applied to an Edison-Bell phonograph of a usual and well-known type, the section being taken transversely to the cylinder thereof. Fig. 2 is a view at right angles to Fig. 1. Fig. 3 is a view in perspective of a portion of the phonograph, showing the "on" and "off" levers; and Figs. 4 and 5 are views, drawn to a larger scale than that of Fig. 1, to illustrate the action of the "off" and "on" levers of the phonograph. Fig. 6 is a perspective view, also on a larger scale, of a detail of Fig. 1.

Like letters indicate like parts throughout the drawings.

A is the recorder and reproducer, hinged so as to be movable toward or away from the record-cylinder.

C is the off lever, and D an on lever. The off lever has a laterally-extended bail or working face C', upon which the recorder and producer A bears by means of a strut A'. The on lever D, which in effect is a spring-detent, tends always to engage automatically with a pin C²

on the off lever C, so that normally when the outer end of the latter is fully depressed, as in Fig. 5, the on lever causes the off lever to retain, through the bail C' and strut A', the recorder and reproducer A clear of the record, cylinder B. The on lever, as hereinafter explained, is not necessary for the purposes of my invention, and is in Fig. 5 shown as being prevented from engaging the off lever.

With such apparatus I combine improvements as follows:

To the frame of the instrument I pivot at E a lever F, coupled at one end to the off lever C by a wire or other connection C³, and at the other end to a pedal G by a rod G'.

H is a guide-frame secured to the main frame of the apparatus to guide the rod G', which reciprocates vertically in slots therein.

I is a helical spring which encircles the rod G' and is in compression between the part H' of the guide-frame H and a stop G², which encircles and is fixed on the rod. The stop G² (see Fig. 6) is made in two parts G³ G⁴, with an opening at G⁵ between them. Two screws G⁶ pass through the part G³ and engage with the part G⁴. By tightening up these screws after the stop G² has been placed on the rod G', the latter being received in the opening G⁵, the two parts G³ G⁴ are drawn together to grip the rod firmly, so that the stop may not slip thereon. The spring I tends to keep the rod G' and its connections in the position in which they are shown in dotted lines in Figs. 1 and 2—that is to say, in a position in which the recorder and reproducer A is retained clear of the cylinder B. By depressing the pedal G the action of the spring I is overcome and the off lever C rises while the bail C' drops to allow the recorder and reproducer A to descend into contact with the cylinder B, as indicated in full lines in Fig. 1.

In order that the recorder and reproducer may be free to descend when the outer end of the off lever is released, the on lever D must not be operative to hold the off lever. Therefore I retain the on lever in an inoperative position by a wire hook J, Figs. 3 and 5, attached to the instrument, or I remove it altogether.

Instead of the spring H, I may use for a similar purpose springs applied to other parts of the apparatus, or I may use a counterbalance

upon the recorder and reproducer, and connect the pedal apparatus directly thereto, or I may employ any other pedal-controlled devices to cause the instrument to become inactive when the pedal control ceases.

I may arrange the pedal to move laterally when depressed, into a notch, like a harp-pedal, for instance, or otherwise retain it in its lower position.

Apparatus constructed and operating according to my invention may be applied to the starting and stopping levers of phonographs or the like, instead of being used to operate upon the recorder and reproducer; and although I have described by way of example the application of my invention to an Edison-Bell phonograph I do not limit my invention to that particular application.

I claim—

1. In a phonograph, the combination with the recorder having the depending strut, of the lever C having the laterally-extending bail at its inner end upon which the strut rests, the pivoted lever F connected at one end to said lever C, the movable rod G' co-operating with the opposite end of said lever F, the spring for elevating said rod, and a pedal for depressing the rod against the tension of the spring; substantially as and for the purpose set forth.

2. In a phonograph, the combination with the recorder having the depending strut, of

the lever for holding said recorder out of operation, the pivoted lever connected at one end to said first-mentioned lever, the rod co-operating with the opposite end of said pivoted lever, and means for operating said rod; substantially as described.

3. In a phonograph the combination with an off lever such as C and an on lever such as D of a spring-controlled or counterbalanced lever such as F a pedal G and means for retaining the on lever out of action substantially as and for the purpose described.

4. In a phonograph, the combination with the recorder, the lever for holding said recorder out of operation, the pivoted lever connected at one end to said first-mentioned lever, the reciprocating rod coöperating with the opposite end of said pivoted lever, a guide-frame secured to the frame of the apparatus, in which the rod reciprocates, the stop at the lower end of the frame and the adjustable stop carried by the rod, and the spring encircling the rod, and confined between the two stops; substantially as described.

In testimony whereof I have hereto set my hand in the presence of the two subscribing witnesses.

LESLIE STEPHEN ROBINSON.

Witnesses:

HAROLD WADE,
B. E. DUNBAR-KILBURN.



(No Model.)

E. H. AMET.
GRAPHOPHONE.

No. 562,693.

Patented June 23, 1896.

FIG. 1.

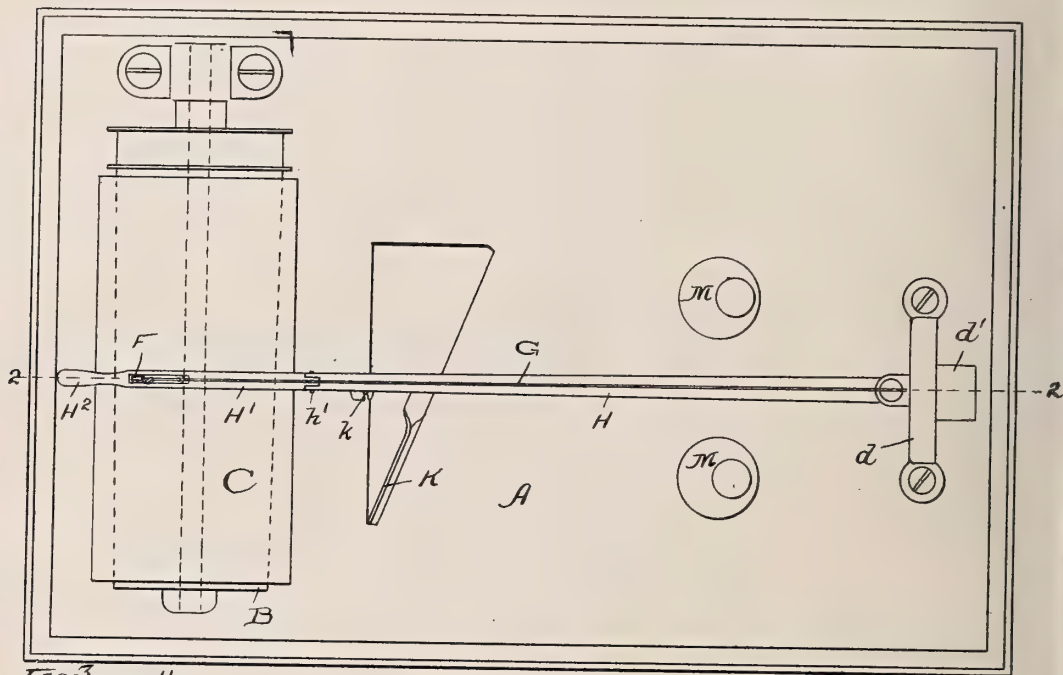
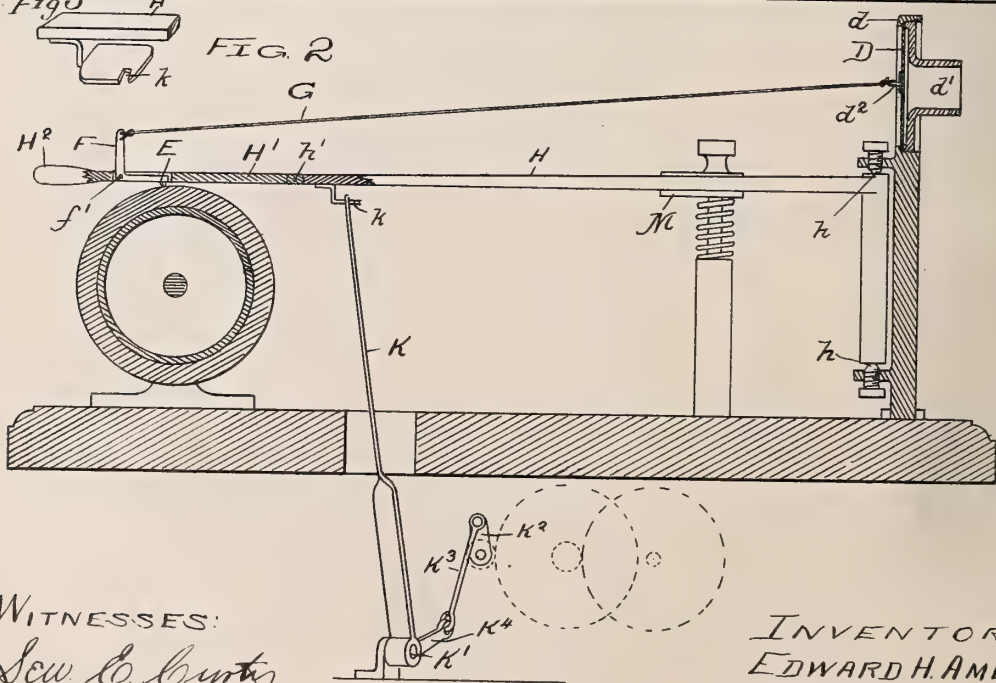


FIG. 2



WITNESSES:

Sec. C. Curtis
A. W. Munday

By Munday, Curtis & Adcock

INVENTOR:
EDWARD H. AMET

HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD HILL AMET, OF WAUKEGAN, ILLINOIS, ASSIGNOR OF ONE-HALF
TO CHARLES DICKINSON, OF CHICAGO, ILLINOIS.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 562,693, dated June 23, 1896.

Application filed June 6, 1895. Serial No. 551,852. (No model.)

To all whom it may concern:

Be it known that I, EDWARD HILL AMET, a citizen of the United States, residing in Waukegan, in the county of Lake and State of Illinois, have invented a new and useful Improvement in Graphophones, of which the following is a specification.

My invention relates to graphophones or phonogram reproducers.

The object of my invention is to provide a machine of a simple, cheap, and durable construction, by means of which phonograms or sound-writings may be accurately and perfectly reproduced, without the more or less harsh and disagreeable grating with which such reproductions have heretofore generally been accompanied in graphophones heretofore in use.

In my invention I employ a stationary diaphragm fixed to the frame of the machine and connect the same to the reproducing-stylus by a soft flexible cord or thread, preferably of silk, the horizontal travel of the stylus from one end of the phonogram-cylinder to the other being provided for by a horizontally-swinging arm pivoted to the frame near the stationary diaphragm. The stylus is secured to the lower or horizontal arm of a bell-crank lever, to the upper or vertical arm of which is secured the soft cord leading to the diaphragm. The stylus and its supporting or carrying arm are thus free to be swung or moved from one end to the other of the phonogram-cylinder as it revolves by the simple operation of the stylus following the spiral line of sound-writing on the cylinder, the writing itself acting as a screw-thread to swing the stylus-carrying arm on its pivot as required.

My invention consists in the novel devices and novel combinations of parts and devices herein shown and described, and specified in the claims.

In the accompanying drawings, Figure 1 is a plan view of a mechanism embodying my invention. Fig. 2 is a vertical longitudinal sectional view on line 2 2 of Fig. 1, and Fig. 3 is a detail perspective view of a part hereinafter described.

In the drawings, A represents the frame of the machine.

B is the phonogram-holding revolving cylinder or shaft, the same extending, as usual, in a horizontal position and being continuously revolved by any suitable mechanism or motor. The phonogram shaft or holder B has no traveling or traversing movement, but simply rotates on its axis.

As the mechanism for continuously revolving the phonogram cylinder or holder is already well known to those skilled in the art, and as my invention is entirely independent of the particular construction of this driving mechanism or motor, it is not necessary to a full understanding of my improvement to herein show or describe this driving mechanism or motor.

C is the phonogram-cylinder, of wax or other material, upon which the sound writing to be reproduced has been made.

D is the stationary diaphragm, its ring d being fixed to the frame A. It is furnished, as usual, with a bell or funnel d' , to which the ear-tube may be connected. This stationary diaphragm is preferably fixed to the frame at a distance of about eight inches from the revolving diaphragm cylinder or holder B and slightly above it.

E is the reproducing-stylus, the same being of any ordinary or suitable construction.

F is the bell-crank lever, to the lower horizontal arm of which the reproducing-stylus is secured.

G is a soft flexible cord, preferably of waxed silk or cotton, attached at one end to the vertical upper arm of the bell-crank lever F, and secured at its other end to the diaphragm D, preferably at the center thereof. This attachment is made preferably by means of a small hook d^2 , glued or cemented to the diaphragm.

H is a horizontally-swinging lever or arm pivoted to the frame at one end near the diaphragm, and preferably below the same. The bearing or journal h h for this lever is preferably of the pivot or center-bearing type, so that it may swing or turn horizontally with little friction. The horizontally-swinging arm or lever H is also preferably furnished with a movable section or member H' hinged or pivoted at h' to the main portion of the lever by a horizontal pivot. The

bell-crank lever F, carrying the reproducing-stylus E, is pivoted at f' to this hinged outer section or member H' of the lever H.

Owing to the length of the horizontally-swinging arm, upon the outer end of which the reproducing-stylus is mounted, the reproducing-stylus is adapted to move from one end of the phonogram-cylinder to the other and still remain at all times very nearly directly over the axis of the phonogram-cylinder, as the horizontal arc in which the stylus moves carries it very little out of a straight line in moving half the length of the phonogram-cylinder; and as the phonogram-cylinder is ordinarily about two inches in diameter, this slight movement of the stylus to one side of a vertical plane through the axis of the phonogram-cylinder I find does not interfere in the least with the proper operation of the machine.

As the connection between the diaphragm and stylus is made through the agency of a soft flexible cord stretched gently taut, all disagreeable, harsh, or strident sounds, due to the riding of the stylus over the phonogram, are obviated and the sounds are reproduced with great accuracy and perfection and very free from disagreeable modification through the action of the reproducing mechanism. In this respect my graphophone operates much on the same principle as the old lovers' telegraph or string-telephone. The horizontally-swinging reproducing-stylus-carrying arm H, after traversing the phonogram-cylinder from end to end, may be returned to the beginning of the cylinder by hand by simply taking hold of the handle H² at the end of the lever and swinging it back. For convenience, however, I have provided the mechanism with a device for automatically returning the arm H to its first position after reaching the farther end of the cylinder. This returning device may be of any suitable kind, form, or construction. In the drawings I have illustrated one suitable form of mechanism for this purpose, the same consisting of a vibrating spring or flexible arm K, pivoted at K' to the frame of the machine and adapted to vibrate normally in a diagonal plane across the machine and under the swinging arm H, and to engage the hook k , secured to said swinging arm only when the swinging arm reaches the final end of the phonogram-cylinder, and then, after thus engaging said hook, to move transversely across the machine and return the arm H to the other end of the cylinder, at which point the flexible lever K automatically disengages the hook by slipping out of it, the disengagement at this side being due to the radial or pivotal movement of the flexible arm K about its own pivot or center of motion. By reason of the arm K being made flexible or in the form of a light flat spring, it is, by its bending, adapted to move transversely with the hook k when in engagement therewith, instead of diagonally, as it does normally. The flexible arm K may be auto-

matically and continuously vibrated back and forth by any suitable connecting mechanism, connecting it with the motor which drives the phonogram cylinder or holder B. As illustrated in the drawings, this mechanism consists simply of a crank K² on one of the shafts of the motor, connected by a link K³ with an arm K⁴, secured to or made integral with the flexible lever K.

To limit the throw of the horizontally-swinging arm H, stops M M are provided, the same being made cam-shaped, so that by turning them the throw may be adjusted to cylinders of different lengths.

As the outer member H' of the horizontally-swinging arm H is pivoted to the main portion of said arm, and as the lever H is supported in a horizontal position by its pivot-bearings $h h$, it will be observed that the weight of this hinged section of the lever carrying the stylus causes the stylus to ride gently upon the phonogram-cylinder, and at the same time, through the bell-crank lever F, to keep the flexible cord G properly taut.

I claim—

1. In a graphophone, the combination with a non-traversing phonogram-holder and a stationary diaphragm of a traveling or movable reproducing-stylus, free to traverse the phonogram cylinder or record and means for connecting the movable stylus mechanically with the stationary diaphragm, substantially as specified.

2. In a graphophone the combination with a non-traversing phonogram-holder and a stationary diaphragm of a pivoted horizontally-swinging arm, and a reproducing-stylus mounted upon the outer end of said arm and having a mechanical connection with said diaphragm, substantially as specified.

3. In a graphophone the combination of a non-traversing revolving phonogram cylinder or holder and a stationary diaphragm, with a movable or traveling reproducer-stylus adapted to move from end to end of the cylinder, and a horizontally swinging or pivoted arm upon which the reproducing-stylus is mounted and by which it is carried to and from end to end of the cylinder and a mechanical connection between said diaphragm and stylus, substantially as specified.

4. The combination with a horizontal revolving, non-traversing phonogram cylinder or holder, of a stationary sound-reproducing device or diaphragm, a horizontally-swinging arm and a reproducing-stylus carried by said arm and free to be swung or moved from one end of the cylinder to the other as the cylinder revolves by the thread or spiral writing on the cylinder itself, and means connecting mechanically said movable stylus and said stationary sound-reproducing device or diaphragm for conveying the sound-vibrations from the stylus to said sound-reproducing device or diaphragm, substantially as specified.

5. The combination with a horizontal revolving, non-traversing phonogram cylinder

or holder, of a stationary sound-reproducing device or diaphragm, a horizontally-swinging arm and a reproducing-stylus carried by said arm and free to be swung or moved from one end of the cylinder to the other as the cylinder revolves by the thread or spiral writing on the cylinder itself, and means connecting mechanically said movable stylus and said stationary sound-reproducing device or diaphragm for conveying the sound-vibrations from the stylus to said sound-reproducing device or diaphragm, said horizontally-swinging arm having a vertically-hinged section or member upon which the stylus is directly mounted, substantially as specified.

6. In a graphophone, the combination with the stationary diaphragm, of a horizontal revolving non-traversing phonogram-holder, a horizontally-swinging arm pivoted to the frame near said diaphragm and provided with a vertically-swinging hinged section, a bell-crank lever mounted upon said hinged section, a reproducing-stylus secured to said bell-crank lever, and means connecting said bell-crank lever with said diaphragm, substantially as specified.

7. In a graphophone, the combination with the stationary diaphragm, of a horizontal revolving non-traversing phonogram-holder, a horizontally-swinging arm pivoted to the frame near said diaphragm and provided with a vertically-swinging hinged section, a bell-crank lever mounted upon said hinged section, a reproducing-stylus secured to said bell-crank lever, and a soft flexible cord connecting said bell-crank lever with said diaphragm, substantially as specified.

8. In a graphophone, the combination with the stationary diaphragm, of a horizontal revolving phonogram-holder, a horizontally-swinging arm pivoted to the frame near said diaphragm and provided with a vertically-swinging hinged section, a bell-crank lever mounted upon said hinged section, a reproducing-stylus secured to said bell-crank lever, a soft flexible cord connecting said bell-crank lever and mechanism for automatically returning said horizontally-swinging arm to position, substantially as specified.

9. In a graphophone, the combination with a stationary diaphragm, of a horizontal revolving phonogram-holder, a horizontally-swinging arm pivoted to the frame near said diaphragm and provided with a vertically-swinging hinged section, a bell-crank lever mounted upon said hinged section, a reproducing-stylus secured to said bell-crank lever, a soft flexible cord connecting said bell-crank lever with said diaphragm, and mechanism for automatically returning said horizontally-swinging arm to position, the same consisting in a continuously-moving diagonally-vibrating flexible lever adapted to en-

gage said horizontally-swinging arm, substantially as specified.

10. In a graphophone, the combination with the stationary diaphragm, of a horizontal revolving phonogram-holder, a horizontally-swinging arm pivoted to the frame near said diaphragm and provided with a vertically-swinging hinged section, a bell-crank lever mounted upon said hinged section, a reproducing-stylus secured to said bell-crank lever, a soft flexible cord connecting said bell-crank lever with said diaphragm and mechanism for automatically returning said horizontally-swinging arm to position, the same consisting in a continuously-moving diagonally-vibrating flexible lever adapted to engage said horizontally-swinging arm, said horizontally-swinging arm being furnished with a hook *k* to engage said flexible lever, substantially as specified.

11. The combination with a revolving horizontal, non-traversing phonogram-holder, of a stylus, and a horizontally-swinging pivoted stylus-carrying arm moved from one end of the cylinder to the other by the riding of the stylus in the thread or spiral line of writing on the phonogram-cylinder itself, a diaphragm or sound-vibratable device mounted on the stationary frame of the machine and mechanical means for communicating the sound-vibrations from said movable stylus to said stationary sound-vibratable device, substantially as specified.

12. The combination with a revolving horizontal non-traversing phonogram-holder, of a horizontally-swinging pivoted stylus-carrying arm, a stationary diaphragm, a stylus and mechanical means for connecting the stylus and the diaphragm, substantially as specified.

13. The combination with a revolving horizontal phonogram-holder of a horizontally-swinging pivoted stylus-carrying arm, a stylus operating to swing said arm on its pivot from one end of the holder to the other by following the thread or line of writing on the phonogram-cylinder itself and mechanism for automatically returning said swinging arm to position, said stylus-carrying arm being free to vibrate or swing horizontally on its pivot substantially as specified.

14. The combination with a revolving horizontal phonogram-holder, of a horizontally-swinging pivoted stylus-carrying arm, and mechanism for automatically returning said swinging arm to position, said mechanism comprising the diagonally-vibrating flexible arm adapted to engage and disengage said horizontally-swinging arm, substantially as specified.

EDWARD HILL AMET.

Witnesses:

H. M. MUNDAY,
S. E. CURTIS.

(No Model.)

E. H. AMET.
GRAPHOPHONE OR DEVICE FOR REPRODUCING SOUNDS FROM
SOUND WRITINGS.

No. 562,694.

Patented June 23, 1896.

FIG. 1.

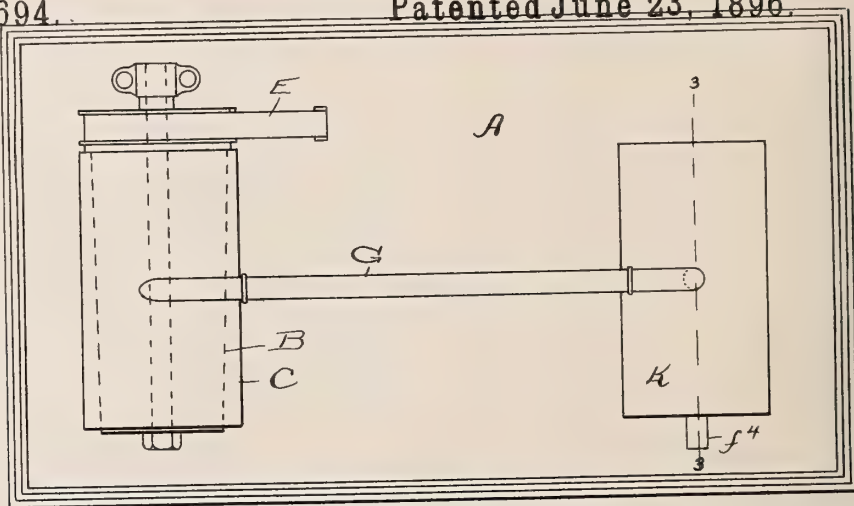


FIG. 2.

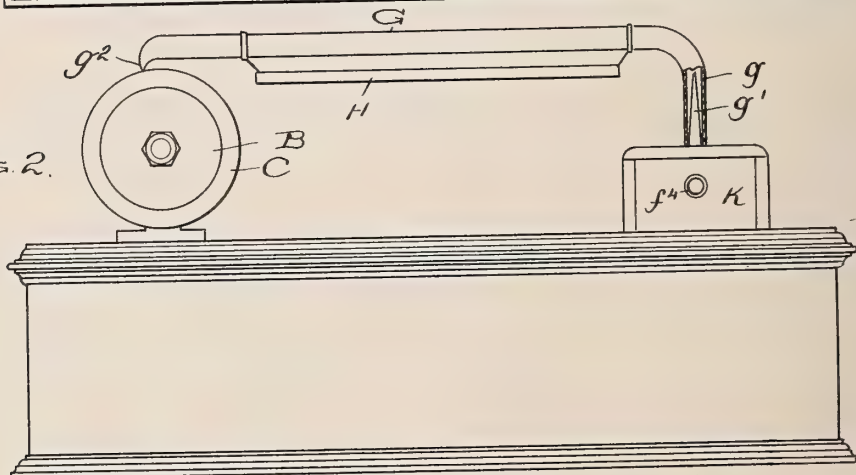


FIG. 3.

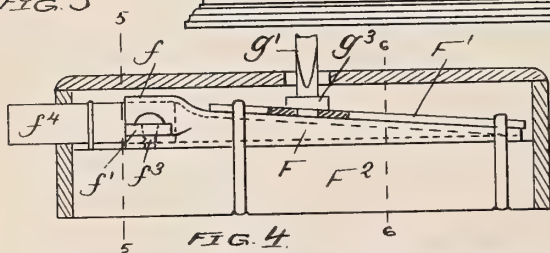


FIG. 4.

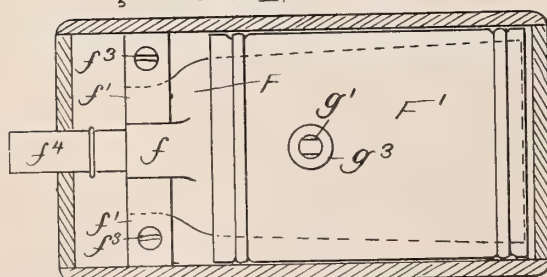


FIG. 5.

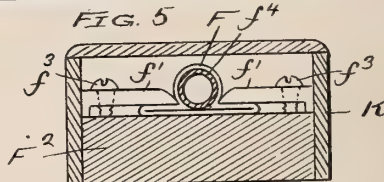
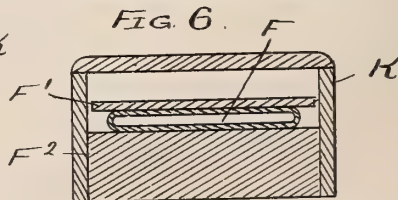


FIG. 6.



WITNESSES

Sew & Curtis
H. W. Munday

INVENTOR:
EDWARD H. AMET

BY Munday, Davis & Adcock,

HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF WAUKEGAN, ILLINOIS, ASSIGNOR OF ONE-HALF TO
CHARLES DICKINSON, OF CHICAGO, ILLINOIS.

GRAPHOPHONE OR DEVICE FOR REPRODUCING SOUNDS FROM SOUND-WRITINGS.

SPECIFICATION forming part of Letters Patent No. 562,694, dated June 23, 1896.

Application filed November 20, 1895. Serial No. 569,551. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing in Waukegan, in the county of Lake and State of Illinois, have invented a new and useful Improvement in Graphophones or Devices for Reproducing Sounds from Sound-Writings, of which the following is a specification.

My invention relates to improvements in graphophones or devices designed for reproducing from sound-writings articulate speech, music, or other sounds.

The object of my invention is to produce a graphophone or sound-reproducing mechanism of a simple and cheap construction, which will operate to do this work accurately and perfectly, and without producing disagreeable rasping, grating, or interfering sounds.

I have discovered by my experiments that sounds may be perfectly reproduced from phonograms or sound-writings by simply tying or clamping a piece of rubber tubing between two rigid pieces or sticks, preferably of wood, the pieces being preferably tied or pressed closer at one end than at the other, so as to give the flattened rubber tube a somewhat wedging or tapering form. The arm or bar carrying the reproducing-point rests loosely upon one of the rigid pieces between which the rubber tube is clamped, its other or point end resting upon the phonogram-cylinder or sound-record. The free end of the rubber tube which is tied or clamped between the two pieces of wood may be connected to the ordinary ear-tube or to a horn. The rubber or other elastic tube which is compressed between the two rigid pieces may be of any suitable size or construction. In the first machine I constructed I simply tied with two pieces of ordinary string one end of an ordinary graphophone ear-tube between two pieces of light board about three inches long and each about one-half or three-quarters of an inch in width. I, however, prefer to use a somewhat larger size of rubber tubing, and have used with great success tubing of about one inch in diameter, making the wood or other pieces of rigid material correspondingly wider. Any suitable construction or arrangement may be used to cause the reproducing-point to follow the sound-writing. I, however, prefer to

mount the reproducing-point upon a freely-swinging arm of glass having a bent end pivotally resting upon one of the pieces of stiff or rigid material between which the rubber tube is clamped, so that the free or point end of the arm may be caused to feed or swing by the spiral thread of the sound-writing itself from one end of the phonogram-cylinder to the other, so that no feed-screw or other mechanism will be necessary for feeding or moving either the phonogram-cylinder on the one hand or the rubber tube and its wood or other clamps on the other hand.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, Figure 1 is a plan view of a device embodying my invention. Fig. 2 is a side elevation, partly in section. Fig. 3 is a section on the line 3 3 of Fig. 1. Fig. 4 is a horizontal section through the case containing the rubber tube and the two pieces of wood or other rigid material between which the tube is clamped. Figs. 5 and 6 are cross-sections on lines 5 5 and 6 6, respectively, of Fig. 3.

In the drawings, A represents the frame of the machine, the same being preferably in the form of a box or case inclosing the spring or other motor by which the shaft or holder B for the phonogram-cylinder C is driven by the belt E or other connection.

F is an elastic tube, preferably of rubber, clamped or compressed between two pieces, preferably flat pieces, of stiff or rigid material F' F², the same being preferably of wood. The two pieces F' F² are clamped or tied firmly together at their rear end, so as to close the tube at this rear or inner end, while the two pieces are not clamped so closely together at their front end, so that the tubing between them is given a tapering form from one end of the clamps F' F² to the other. The clamps or pieces of wood F' F² may be in this manner secured or clamped together by any suitable means, but preferably by tying or securing strings or bands around them.

G is the reproducing-point-carrying arm, made preferably of glass, its point end resting upon the phonogram-cylinder or sound-writing and its other end resting loosely upon the upper one F' of the two pieces of wood

between which the rubber tube F is clamped or compressed. The arm G is preferably hollow or made of a glass tube, and it is bent at one end to form a right-angle socket *g* to fit over the upright pin *g'*, which is attached to the clamp-piece F'. The reproducing-point *g*² is preferably of glass and formed integral with its carrying-arm G. The pin *g'* fits loosely in the socket *g* of the arm G and it is provided, preferably, with a collar or shoulder *g*³. To increase the weight of the hollow arm G, I attach to it a weight H, preferably by strings or threads.

The reproducing-point-carrying arm G swings laterally or horizontally from one end of the phonogram-cylinder or sound-writing to the other, its bent end *g* turning on the pin *g'* as a pivot. It is thus swung laterally or horizontally in the forward or feed direction through the agency of the spiral groove or thread of the sound-writing record itself. It may be swung back or returned to position by hand or by any suitable mechanism for this purpose.

The rubber or elastic tube F is preferably made larger in diameter than the ordinary ear-tubes used with graphophones, and to suitably contract its free end *f* for connection with such smaller tubing I provide a clamp consisting, preferably, of two metal parts *f'* *f'*, secured by screws *f*³ *f*³ to the lower wood piece F², and which serve to form a fold in the larger tubing and thus contract the diameter of its free end, as indicated in Fig. 5. A short tube *f*⁴, preferably of glass, metal, or other rigid material, is preferably employed as a connection between the rubber tube F and the ear tube or horn or other device which may be employed for conveying or distributing the sound.

Any other suitable means known to those skilled in the art may be employed as a substitute or equivalent for the arm G for communicating the sound-vibrations to the rubber tube F, clamped taperingly between the two pieces F' F² of stiff or rigid material.

The sound-reproducing device consisting of the rubber tube F, clamped taperingly between the two pieces of wood F' F², is prefer-

ably inclosed in a case K, secured to the frame or box A.

I claim—

1. A sound-reproducing device, consisting in an elastic tube clamped or compressed between two stiff or rigid pieces, and means for transmitting sound-vibrations to one of said stiff or rigid pieces substantially as specified.

2. A sound-reproducing device, consisting in a rubber tube taperingly clamped or compressed between pieces of stiff or rigid material, and means for transmitting sound-vibrations to one of said stiff or rigid pieces substantially as specified.

3. A sound-reproducing device, consisting in an elastic tube clamped between two stiff or rigid pieces, in combination with a rotating phonogram-cylinder, a reproducing-point and means for communicating the sound-vibrations from the reproducing-point to said sound-reproducing device, substantially as specified.

4. A sound-reproducing device, consisting in a rubber tube clamped taperingly between pieces of stiff or rigid material, in combination with a rotating phonogram-cylinder, a reproducing-point and means for communicating the sound-vibrations from the reproducing-point to said sound-reproducing device, substantially as specified.

5. The combination with a rotating phonogram-cylinder, of an elastic tube, two clamps between which said tube is compressed, and a horizontally-swinging arm furnished with a reproducing-point at one end resting upon the phonogram-cylinder and resting at the other end upon the upper one of said clamps, substantially as specified.

6. In a sound-reproducing device, the combination with the tube F, of clamp-pieces F' F², and clamps *f'* *f'* for contracting the free end of said tube F, and means for communicating sound-vibrations to one of said clamp-pieces substantially as specified.

EDWARD H. AMET.

Witnesses:

EDMUND ADCOCK,
H. M. MUNDAY.

(No Model.)

E. H. AMET.
GRAPHOPHONE.

No. 562,753.

Patented June 23, 1896.

FIG. 1.

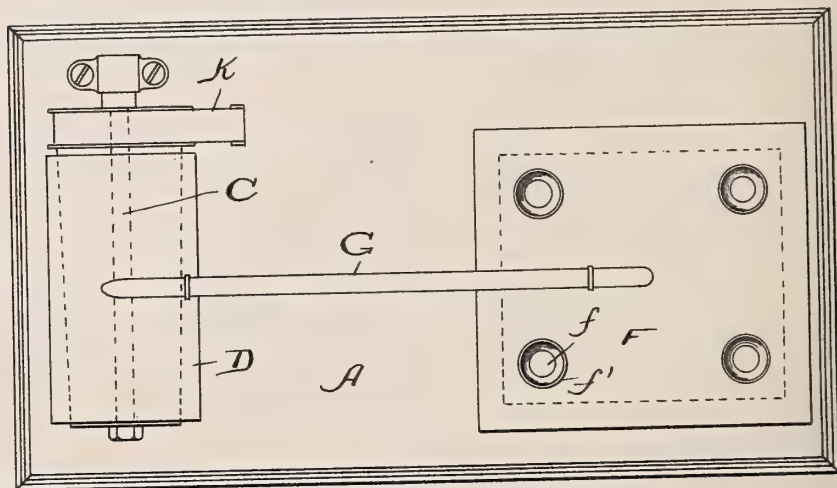


FIG. 2.

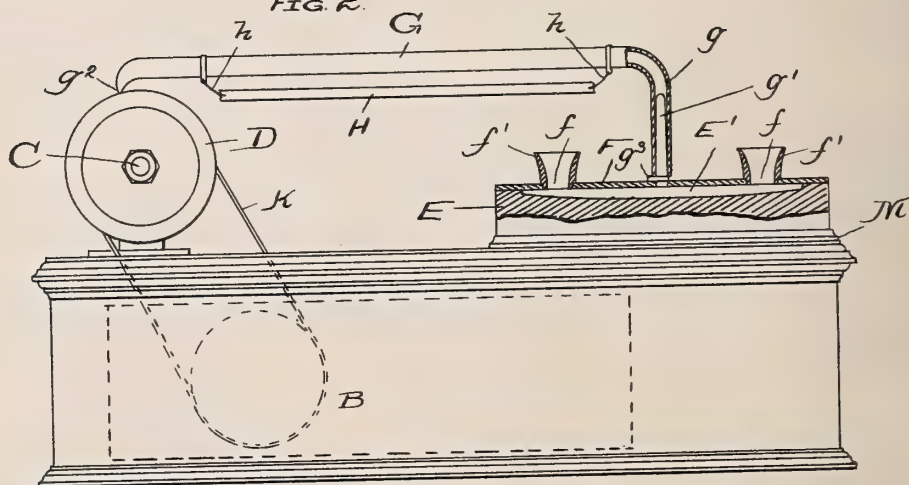


FIG. 3.

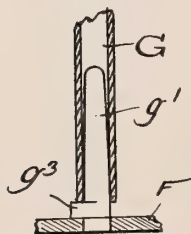
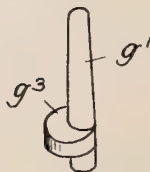


FIG. 4.



WITNESSES:

Lew. C. Curtis
H. W. Munday

INVENTOR:
EDWARD H. AMET

BY *Munday, Curtis & Adcock,*
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF WAUKEGAN, ILLINOIS, ASSIGNOR OF ONE-HALF TO
CHARLES DICKINSON, OF CHICAGO, ILLINOIS.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 562,753, dated June 23, 1896.

Application filed September 16, 1895. Serial No. 562,645. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing in Waukegan, in the county of Lake and State of Illinois, have invented a new and useful Improvement in Graphophones, of which the following is a specification.

My invention relates to improvements in graphophones or devices designed for reproducing articulate speech, music, or other sounds recorded in phonograms or sound-writings.

The object of my invention is to provide a device or mechanism for this purpose of a simple, cheap, and durable construction, by means of which such phonograms or sound-writings may be accurately and perfectly reproduced without any attendant disagreeable scraping, grating, or interfering noises produced by the action of the mechanism. I have discovered that this result may be accomplished; and herein my invention consists by means of a simple sounding-board of wood, suitably secured by glue or otherwise to a base-block, in connection with a simple arm of glass or other suitable material resting at one end on the sounding-board and at the other end resting on the phonogram-cylinder or sound-record, the end of the glass tube or arm resting upon the sound-record being drawn to a fine point, so as to follow the spiral groove or thread of the sound-writing record on the phonogram cylinder or blank, and the end of the glass arm or tube resting on the sounding-board being adapted to permit the arm to swing laterally to enable its outer or pointed end to properly feed from one end to the other of the phonogram-cylinder as said cylinder revolves. By this simple means I have found by experiment that articulate speech, songs, instrumental or other music recorded in sound-writings or phonograms may be accurately and perfectly reproduced with great loudness, clearness, and distinctness, and free from all harsh or interfering sounds.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts,

Figure 1 is a plan view of a graphophone or sound-writing reproducing mechanism embodying my invention. Fig. 2 is a side elevation partly in section. Fig. 3 is an enlarged sectional view showing the connection of the arm with the sounding-board, and Fig. 4 is a perspective view of the connecting-pin.

In the drawings, A represents the frame, the same being preferably in the form of a box or case inclosing the spring or other motor B, by which the shaft or holder C for the phonogram blank or cylinder D is driven or rotated.

E is a block, preferably of wood, secured preferably to the top of the box or frame A.

F is the sounding-board secured to the block or support E, preferably by glue. The block or support E is hollowed out or furnished with a cavity E', so that the sounding-board F, which is preferably square or rectangular in shape, will rest upon the block only at its margin or outer edges. The sounding-board is preferably about four inches by five inches in size, and I prefer to make it about one-sixteenth to one-eighth of an inch in thickness of dry seasoned wood, such, for example, as cedar.

G is the arm, of glass or other suitable material, one end of which rests upon the phonogram-cylinder and the other upon the sounding-board. The arm is preferably hollow and made of a simple single glass tube by bending it at one end to form a right-angle socket *g* to fit over the upright pin *g'*, which is secured to the sounding-board, preferably near its middle or center, and by bending and drawing its other end to a fine point *g²* to adapt this pointed end to follow the thread or spiral groove of the sound-writing. The pin *g'* is preferably of wood and is provided with a flange, shoulder, or collar *g³* at one side of the pin, so that the lower end of the glass tube will only rest, touch, or have a bearing or support at one side or at a short arc of its circumference; that is to say, touching only at the eccentric collar or shoulder *g³* of the pin instead of touching all the way around the pin. This is clearly illustrated at Figs. 3 and 4. The shank of the pin *g'* is inserted through a

suitable hole formed in the sounding-board to receive it, and the pin should also be glued to the sounding-board if it is made in a separate piece therefrom, as shown in the drawings. The point or pointed end g^2 should project at an angle from the tube or arm G, as illustrated in the drawings, so that only the extreme end or point of the arm will touch the sound-writing cylinder when this end of the arm is resting on the cylinder. The connecting-pin g' should be made long enough or project up into the hollow bent arm of the tube far enough to prevent the tube or arm from tilting sidewise when resting on its two bent ends, one bent end on the sounding-board and the other bent end on the phonogram-cylinder or sound-writing. The hollow tube is preferably in diameter about the size of an ordinary lead-pencil and about eight inches in length. In other words, its length should be sufficient to permit the necessary radial or laterally-swinging movement of the arm on its pivot, to allow its pointed end to follow the thread or spiral groove of the sound-writing from one end of the phonogram-cylinder to the other without causing the arc thus described to carry the point g^2 much to either side of a vertical plane passing through the axis of the phonogram-cylinder.

The phonogram-cylinder, sounding-board, and the laterally-swinging arm G should preferably be so combined together that the point g^2 of the arm will always remain slightly to the left of a vertical plane passing through the axis of the phonogram-cylinder, as illustrated in the drawings, as the point g^2 will thus better follow the spiral groove or thread of the sound-writing.

The point g^2 of the arm G, which follows the thread of the sound-writing, is preferably formed by simply bending the end of the tube and drawing it to a point while the glass is heated in the ordinary manner that a glass blower or worker operates, the extreme point naturally forming itself into a smooth and rounded shape. The glass tube or arm G, suitably furnished with the bent end g and with the point g^2 , can thus be made at a very small cost, not exceeding, for example, a few cents apiece, as the glass tube itself is very cheap, and as it only requires a few moments' labor to bend its end g at an angle to form the pivot of the arm and to bend and draw its other end to form the point g^2 , no expensive rounding or polishing of the point being required, as is the case where such points are formed of jewels or other hard substances which are not shaped to the required form by the natural process or law, as is the case in my invention, and the sounding-board and its block can also be produced at an exceedingly small cost, not exceeding a few cents.

To increase the weight of the hollow arm or tube G and cause its pointed end g^2 to better follow the phonogram groove or thread automatically and of itself alone without the inter-

vention or aid of any feed-screw or other mechanism, I preferably attach to it a weight H, the same consisting, preferably, of a bar of metal. The weight H is preferably attached to the arm G by means of two pieces of thread or string or rubber $h h$, tied around the glass arm G at points slightly farther apart than the length of the weight H, so that the two strings $h h$ will incline toward each other and thus prevent the weight having any injurious vibratory or pendulum action.

The laterally or horizontally swinging arm G may be returned from one end of the phonogram-cylinder to the other after it has followed it from end to end, in order to again reproduce the sound writing or record on the phonogram-cylinder, by hand or by any suitable automatic mechanism for this purpose.

K is the belt by which the phonogram cylinder, shaft, or holder is driven from the spring or other motor.

The sounding-board F is preferably provided with one or more holes or openings f to permit the escape of the sound-waves from the air-cavity between the sounding-board and its block or support. These openings or holes f may also preferably be furnished with short horns f' , made of wood and inserted in the holes. These flaring tubes or horns f' also afford a means for receiving or attaching a rubber ear-tube, if desired.

It will be observed that the rotating phonogram-cylinder or sound-writing record is mounted in fixed or stationary bearings on the frame, and has no feed movement, and that the sounding-board is also fixed in position and has no feed movement, and that the reproducing-arm rests loosely at one end on the sounding-board and at the other end on the phonogram-cylinder or sound-writing, and that the spiral groove or thread of the sound-writing itself serves as the means for swinging the arm laterally to feed the point end thereof from one end to the other of the cylinder. The bent end g of the tube G fits the wood pin g' loosely, so as to permit the arm to swing laterally on this pin as a pivot. After the extreme circular end of the tube is cut or broken off it should be stuck in the flange a moment, so as to render this end smooth and thus prevent any undue friction between it and the flange or collar g^3 of the pin g' .

Between the frame or case A and E, I place a sound-insulating packing M, preferably of felt, rubber, or other like material.

I claim—

1. A graphophone or mechanism for reproducing sounds from phonograms or sound-writings, consisting in connection with the phonogram-cylinder or sound-writing of a sounding-board, and an arm resting loosely at one end on the sounding-board and at the other end on the phonogram-cylinder or sound-writing, substantially as specified.

2. The combination with a rotating phono-

gram-cylinder or sound-writing, of a fixed or stationary sounding-board and a glass arm having an integral point at one end to ride on the phonogram-cylinder or sound-writing, said arm resting at one end on the sounding-board and at the other end on the phonogram-cylinder, substantially as specified.

3. The combination with a rotating phonogram-cylinder or sound-writing, of a fixed or stationary sounding-board and a glass arm resting at one end on the sounding-board and at the other end on the phonogram-cylinder, said arm having a loose pivotal connection with said sounding-board, substantially as specified.

4. The combination with a rotating phonogram-cylinder, of a stationary sounding-board furnished with an upwardly-projecting pin and a hollow glass arm having a bent end fitting on said pin, and a pointed bent end at its other extremity resting on the phonogram-cylinder, substantially as specified.

5. The combination with a rotating phonogram-cylinder, of a stationary sounding-board furnished with an upwardly-projecting wood pin and a hollow glass arm having a bent end fitting on said pin, and a pointed bent end at its other extremity resting on the phonogram-cylinder, substantially as specified.

6. The combination with a rotating phonogram-cylinder, of a stationary sounding-board furnished with an upwardly-projecting pin and a hollow glass arm having a bent end fitting on said pin and a pointed bent end at its other extremity resting on the phonogram-cylinder, and a shoulder or collar at one side of said pin so that the bent cylindrical end of said tube will only have a bearing at a portion of its circumference, substantially as specified.

7. The combination with a rotating phonogram-cylinder of a sounding-board, with a hollow arm pointed at one end and resting at the other end loosely pivoted on the sounding-board, said sounding-board being furnished with one or more openings through the same, substantially as specified.

8. The combination with a base-block or support of a sounding-board secured thereto, a phonogram-cylinder and a glass arm resting at one end on the cylinder and the other end on the sounding-board, said glass arm being hollow, having a bent pointed end at one extremity and a right-angle bent end at the other extremity fitting a pin or pivot attached to the sounding-board, substantially as specified.

9. The combination with a base-block or support of a sounding-board secured thereto, a phonogram-cylinder and a glass arm resting at one end on the cylinder and the other end loosely pivoted on the sounding-board, said sounding-board being perforated, substantially as specified.

10. A phonogram or sound-writing record following-point composed of glass and made

integral with the arm by which it is carried, substantially as specified.

11. The means for communicating sound-vibrations from a phonogram or sound record to a sounding-board, consisting of a tube of glass, having an integral point formed on its end to follow the sound-record, substantially as specified.

12. The means for communicating sound-vibrations of a phonogram or sound-record to a sounding-board, consisting of a tube of glass having an integral point formed on its end to follow the sound-record, and having at its other extremity a bent end, one edge of which rests upon the sounding-board, substantially as specified.

13. The means for communicating sound-vibrations of a phonogram or sound-record to a sounding-board, consisting of a tube of glass furnished with a weight consisting of a bar attached at each end to said tube by two threads or cords at points farther apart than the length of the bar, substantially as specified.

14. A graphophone or mechanism for reproducing sounds from phonograms or sound-writings, consisting in connection with the phonogram-cylinder or sound-writing of a sounding-board, and an arm resting loosely at one end on the sounding-board and at the other end on the phonogram-cylinder or sound-writing, and a weight attached to said arm, substantially as specified.

15. The combination with a rotating phonogram-cylinder of a sounding-board with a hollow arm pointed at one end and resting on the phonogram-cylinder, and resting at the other end on the sounding-board, said arm having a pivotal connection with said sounding-board to permit it to swing laterally or horizontally, and a weight attached to said arm, substantially as specified.

16. The combination with a rotating phonogram-cylinder, of a stationary sounding-board furnished with an upwardly-projecting pin and a hollow glass arm having a bent end fitting on said pin, and a pointed bent end at its other extremity resting on the phonogram-cylinder, and a weight attached to said arm by a thread or cord, substantially as specified.

17. The means for communicating sound-vibrations from a phonogram or sound-record to a vibratable body, consisting of an arm resting at one end on the phonogram or sound-record and at the other end loosely pivoted on the vibratable body, substantially as specified.

18. The combination with a base or support of a vibratable body secured to said base or support, a phonogram-cylinder, and an arm having an integral point at one end resting on the phonogram-cylinder, and said arm resting at its other end on said vibratable body, substantially as specified.

19. The combination with a base or support

of a vibratable body secured to said block, a
phonogram - cylinder, an arm resting at one
end on the cylinder and the other end on the
vibratable body, and a sound-insulating pack-
5 ing between said block and the frame, sub-
stantially as specified.

20. A phonogram or sound-writing record
following-point, composed of glass and shaped

by the natural tendency of the glass when
molten to assume a globular or rounded form, 10
substantially as specified.

EDWARD H. AMET.

Witnesses:

H. M. MUNDAY,
S. E. CURTIS.

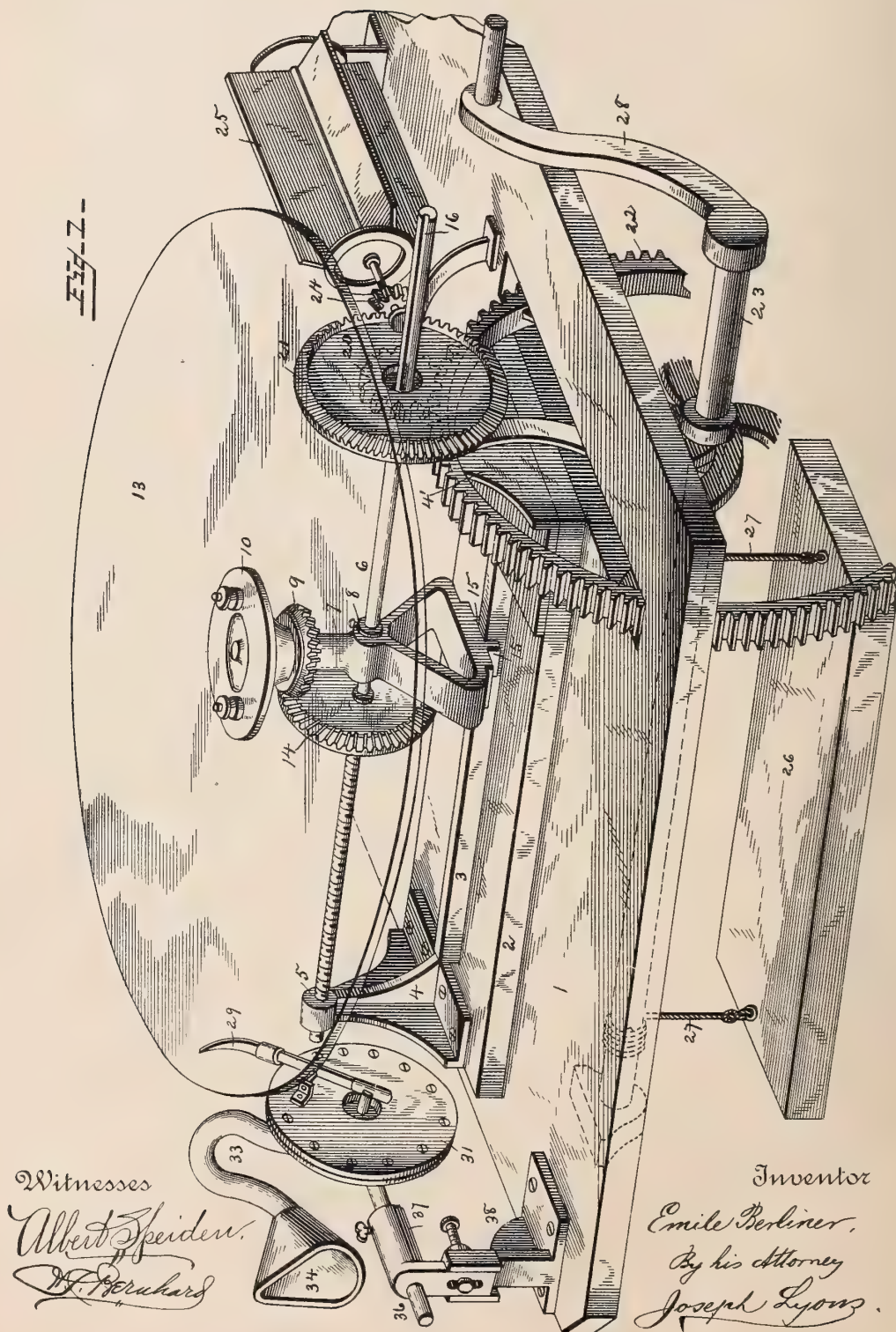
(No Model.)

3 Sheets—Sheet 1.

E. BERLINER.
GRAMOPHONE.

No. 564,586.

Patented July 28, 1896.



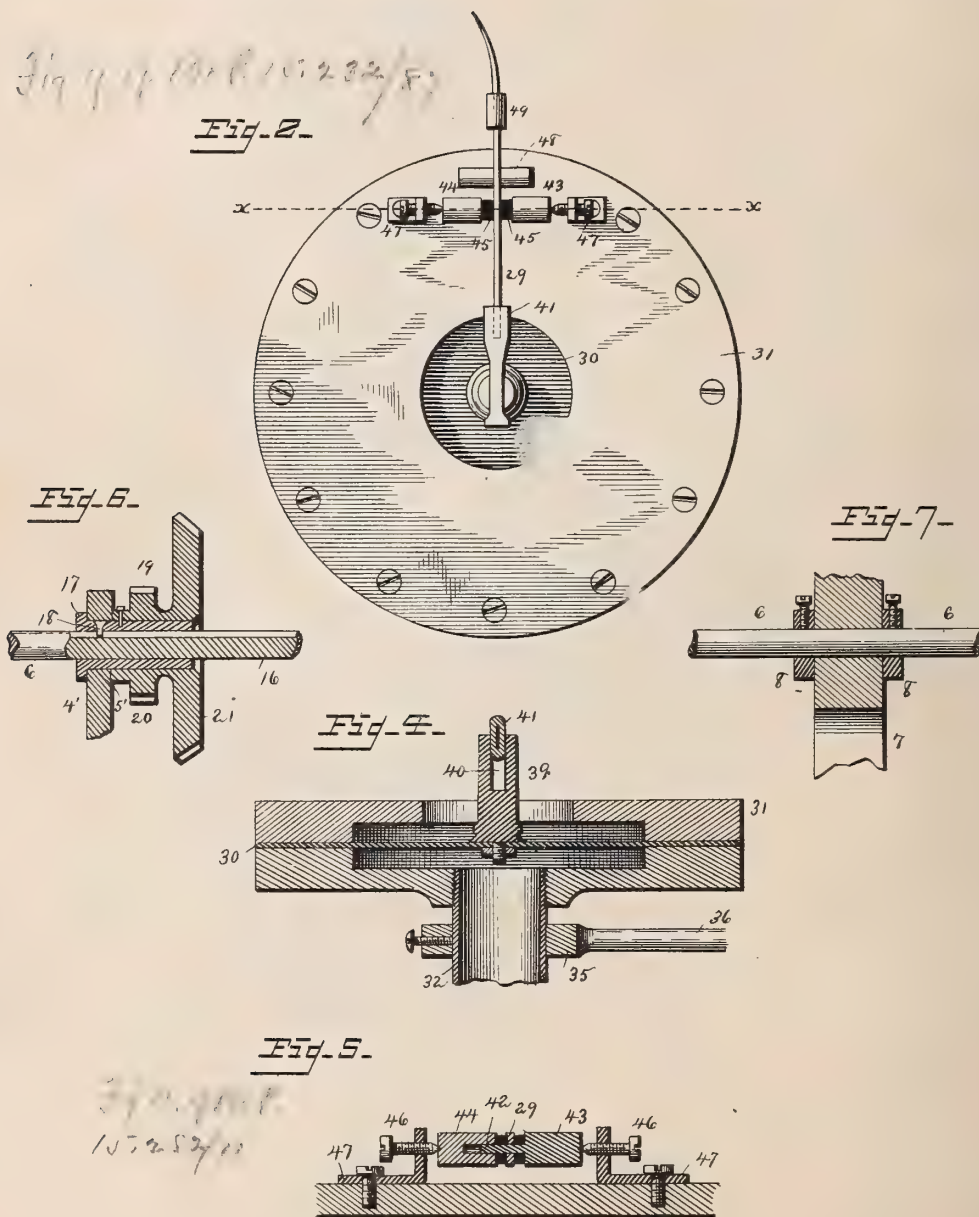
(No Model.)

3 Sheets—Sheet 2.

E. BERLINER.
GRAMOPHONE.

No. 564,586.

Patented July 28, 1896.



Witnesses

Albert Spuden.

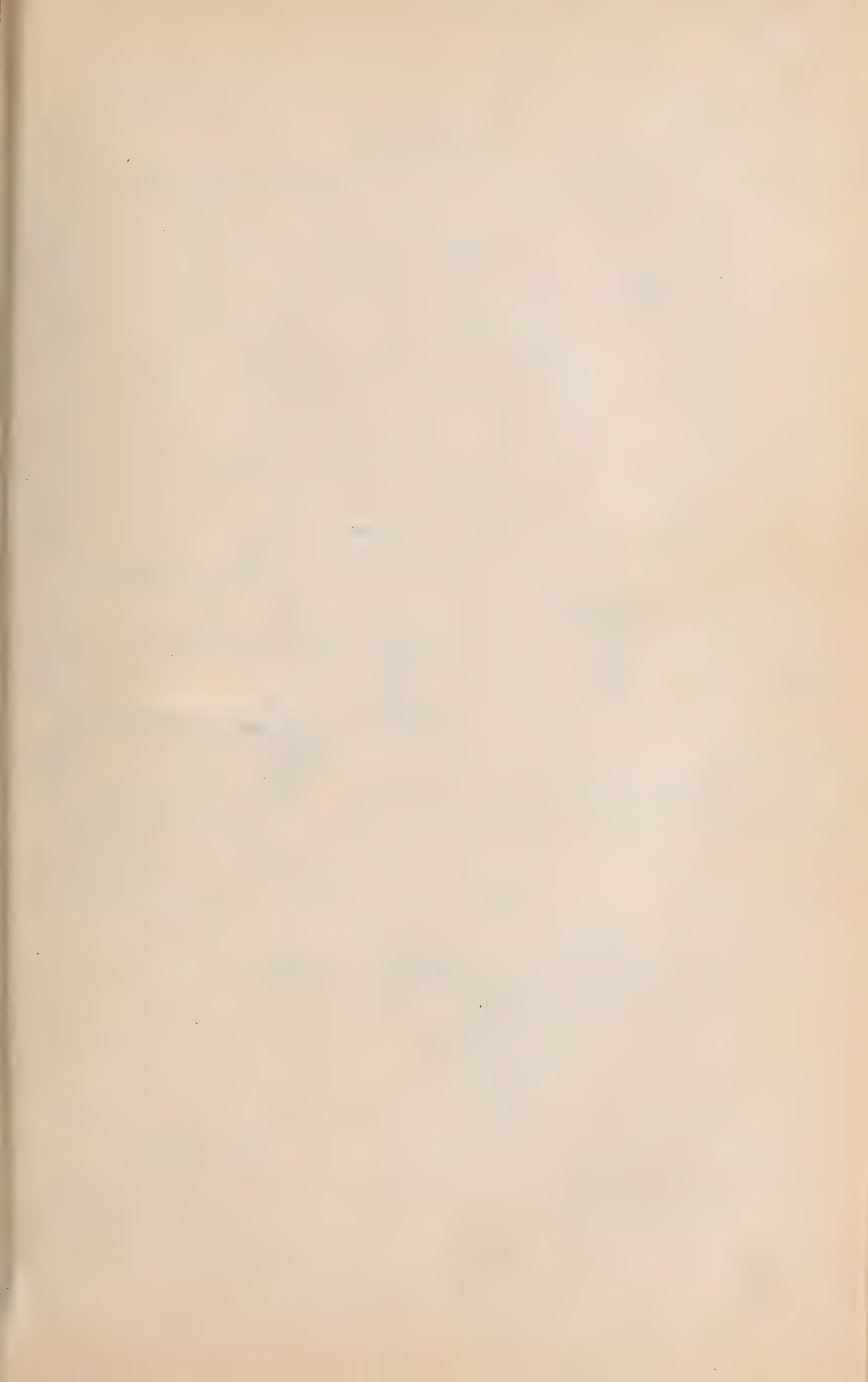
F. Berichard

Inventor

Emile Berliner.

By his Attorney

Joseph Lyons.



(No Model.)

3 Sheets—Sheet 3.

E. BERLINER.
GRAMOPHONE.

No. 564,586.

Patented July 28, 1896.

Fig. 9.

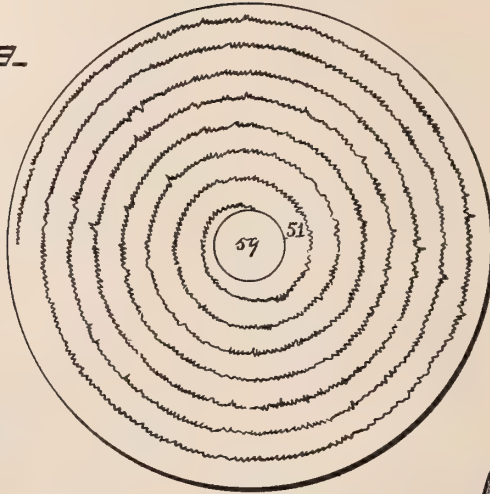


Fig. 8.

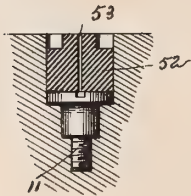


Fig. 10.

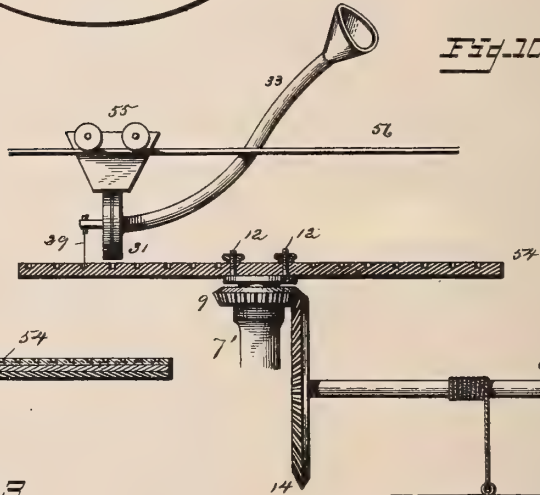
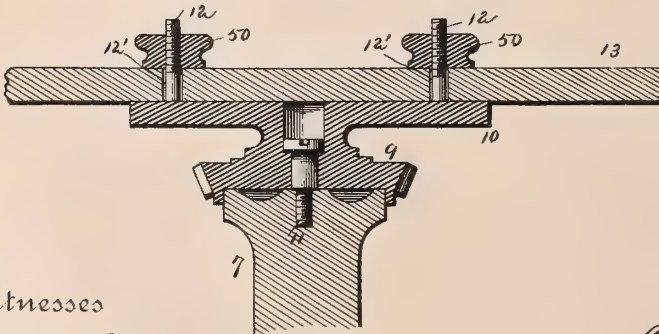


Fig. 11.



Fig. 12.



Witnesses

Albert Spiden.
V. F. Verward

Inventor

Emile Berliner.

By his Attorney

Joseph Lyons.

UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR,
BY MESNE ASSIGNMENTS, TO THE UNITED STATES GRAMOPHONE COM-
PANY, OF WEST VIRGINIA.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 564,586, dated July 28, 1896.

Application filed November 7, 1887. Serial No. 254,541. (No model.) Patented in England November 8, 1887, No. 15,232,

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Gramophones, of which the following is a specification.

My invention has reference to improvements in methods of and apparatus for recording and reproducing spoken words and other sounds, and it is primarily intended as and constitutes an extension and improvement of my gramophone which I have described in Letters Patent No. 372,786, granted to me on November 8, 1887, and for which I have also received Letters Patent of Great Britain, No. 15,232, dated November 8, 1887. In said patents I have described a method of recording and reproducing sounds, which consists in first causing the sounds to inscribe themselves upon a layer of non-resisting material in a manner substantially like that practiced by the well-known Leon Scott phonautograph, then copying the phonautographic record in solid resisting material, preferably by the photo-engraving process, and then reproducing the sounds from the solid copy of the record. The original record, as well as the copy of the same, is thus obtained as an undulatory line of even depth, as distinguished from a line of varying depth obtained by the ordinary phonograph and by the graphophone.

In my present invention I retain all the fundamental features of my gramophone, but introduce certain novel features both in the process and in the apparatus, which render the attainment of the objects of a sound recorder and reproducer more certain and more perfect.

In the original form of my gramophone I employed a curved (cylindrical) surface upon which the non-resisting medium used for recording was supported. This had the disadvantage that for the purpose of copying the record by the photo-engraving process such surface had to be first straightened and the flat copy obtained from the same had to be bent again to the original cylindrical form of the record-surface. This involved delicate and tedious manipulations, which I avoid in

my present invention by inscribing the record of sounds upon a flat plate, and I further improve the process by arranging that flat plate horizontally, or nearly so, and by inscribing the record upon the under surface of the same, whereby the material removed by the recording-stylus drops away from the plate and leaves the undulatory groove of even depth, clean, and well defined, whereas by the old method the material removed by the stylus accumulated in and about the adjacent grooves.

I have further improved the process by using a transparent plate as a support for the non-resisting medium. This plate is therefore made either of glass or some other like substance, whereby I secure several important advantages. The most important of these advantages is that it enables me to work with parallel transmitted rays of light in the subsequent process of photo-engraving, in which the original record is thus used as a negative, which may be directly applied in contact with the sensitive photographic plate, and another important advantage is the reduction of the friction of the stylus upon the supports to a minimum.

The process is further improved by the employment of a new recording medium. In the original process I used a layer of lampblack pure and simple, and this substance is well adapted for the purpose on account of the slight coherence of the particles; but by reason of the flocculent nature of this substance the lines drawn upon it are more or less ragged, as can be observed under a microscope, and the photo-engraving obtained from such record displays all the defects of the original. In my improved process I employ a layer of a semifluid ink or paint, of such consistency and thickness that it will neither subside nor flow spontaneously. Such ink is practically structureless, and the lines drawn upon it are exceedingly sharp and reveal no ragged edges under a powerful microscope, and the photo-engraving from such record is far superior to a like copy from a record produced under the former process.

My invention also comprises other minor improvements in the process, and it also covers novel features in the apparatus, all of which

will more fully appear from the following detailed description, in which reference is made to the accompanying drawings, in which I have illustrated convenient forms of apparatus which I have used, without, however, limiting myself to the exact details of the same.

Figure 1 is a perspective view of my improved gramophone. Fig. 2 is a plan view of the diaphragm, with its support and accessories. Fig. 3 is a vertical section showing the recording-disk and its connection with the driving-wheel. Fig. 4 is a sectional view of the diaphragm, its support, and accessories. Fig. 5 is a cross-section on line *x x* of Fig. 2. Fig. 6 is a sectional view of a part of the driving-gear. Fig. 7 is a section showing the connection of the driven shaft with the support of the recording-disk. Fig. 8 is a sectional view of a centering device. Fig. 9 is a plan view, upon a reduced scale, of a disk with a record of sounds recorded upon the same in accordance with my invention. Fig. 10 is a sectional elevation of a modified form of my reproducing apparatus, and Fig. 11 is a sectional view of a dampened reproducing-disk.

Referring now to the drawings, in which the details are marked by numerals, there is a platform 1, suitably supported, and upon this platform are mounted the operative parts of the apparatus. A metallic plate 2, provided with a longitudinal rib 3, is secured upon the platform, and standards 4 4', mounted upon plate 2, are provided with a nut-bearing 5 and a smooth bearing 5', (see Fig. 6,) respectively, for shaft 6, which extends through these bearings, as shown. One-half, more or less, of this shaft is screw-threaded, as shown, and enters the nut-bearing 5, and at a point near the middle said shaft passes loosely through a movable support 7, the position of which upon the shaft is determined by two collars 8 8, as indicated in Fig. 7.

The support 7 serves as a bearing for a bevel-gear 9, which is centrally perforated and widens out into a circular flange 10. Upon its under side the bevel-gear 9 is recessed, and said recess fits loosely over the upper end of support 7. A screw 11, passing loosely through the central perforation of bevel-gear 9, screws into the head of support 7, so that the bevel-gear can rotate about its axis, which coincides with the axis of screw 11. Two screw-pins 12 12, which may be either fixed or removable, project at diametrically opposite points from flange 10, and are designed to pass through two similarly-located holes in a glass plate 13, as will be more fully described hereinafter.

A bevel-gear 14, fixed upon shaft 6, engages bevel-gear 9, but provision is made for releasing gear 14 from the shaft, if desired, for a purpose which will be explained farther on. As stated above, the screw-threaded portion of shaft 6 passes through nut-bearing 5, and it will now be clear that if shaft 6 is rotated bevel-gear 9, with its flange 10, will likewise rotate, and will at the same time ad-

vance in a straight line, since shaft 6, screwing into or out of its nut-bearing 5, will carry bevel-gear 14 and support 7 with it. From the bottom of support 7 two lugs 15 15, one on each side of rib 3 of plate 2, serve to guide the support with the parts attached thereto in the line of said rib, which is, of course, parallel to shaft 6.

A part of the smooth portion of shaft 6 has a longitudinal groove 16 extending to the right-hand end of the shaft, as seen in Figs. 1 and 6, and a sleeve 17 loosely fitting this portion of the shaft has a pin 18, the end of which engages groove 16, as shown in Fig. 6, so that the shaft is free to slide longitudinally through sleeve 17 and will rotate with the same if the latter is rotated.

Sleeve 17 is fitted into bearing 5' of standard 4', so as to rotate within the same, and upon that part of the sleeve which projects beyond the bearing is keyed the compound gear 19. The latter is composed of a pinion 20 and a bevel-gear 21, and a rather large bevel-wheel 22, mounted upon a shaft 23 below platform 1, meshes with pinion 20.

A small bevel-gear 24 meshes with gear-wheel 21, and to the shaft of gear 24 are secured fans 25, which are thus driven at a high speed and serve as a regulator, as will be readily understood by those skilled in the art.

A weight 26 is suspended by cords or chains 27 from shaft 23, and if said shaft is turned by a crank 28, or otherwise, in one direction the cords or chains are wound upon the same, as indicated in Fig. 1, and the weight 26 is raised up toward the platform. If, on the other hand, the weight is allowed to descend, it will rotate shaft 23, this in turn will rotate gear-wheel 22, which, meshing with pinion 20, will rotate the latter and the connected shaft 6, and in the manner hereinbefore described support 7 will receive a rectilinear motion, while flange 10, upon bevel-gear 9, will both rotate and move in a straight line. For every complete revolution of bevel-gear 14 support 7 and bevel-gear 9, with its connected flange 10, will be moved in the line of a diameter a distance equal to the pitch of the screw-threads upon shaft 6, and it will now be understood that if a plate 13 is fixed to flange 10 and a fixed pencil or stylus be lightly pressed upon the plane surface of said plate a spiral line will be drawn upon the plate.

The recording-stylus 29 is mounted upon a diaphragm 30, and the diaphragm itself, which may be of any suitable sonorous material, is mounted in a case 31, and a rigid tube 32, projecting from one side of the case, communicates with a flexible tube 33 and a mouth or ear piece 34. The tube is clamped and may be adjusted in the direction of its length in a ring 35, formed at the end of a rod 36, which is adjustable in a support 37, and the latter is again adjustable vertically in a standard 38 mounted upon platform 1. A

metal post 39 is fixed to the center of the diaphragm, as shown, and its free end has an axial slot 40, into which a soft-rubber tube 41 is forced and flattened. The free end of the soft-rubber tube receives the stylus 29, which may be of metal or any other hard and fairly elastic material.

Preferably the stylus is made of a flat strip of phosphor-bronze extending radially over the face of casing 31 and some distance beyond the edge of the same. At its free end the stylus is reduced to a point and is curved upwardly, and by turning the diaphragm-case about the axis of tube 32, or by turning rod 36 in its bearing 37, or by adjusting the latter upon bracket 38 the point of the stylus may be brought into light contact with the lower face of disk 13 at a point in the diameter of said disk which is parallel with shaft 6.

Near the middle of its length a hole is produced through the stylus, and a pin 42, formed at one end of a metal block 43, passes through said hole and into the central bore in a similar block 44. Between each block and the adjacent face of the stylus a soft-rubber washer 45 is inserted, and the two blocks are forced together and are made to clamp the stylus between the rubber washers by means of the pointed screws 46, working in the supports 47. The screws 46 46 thus constitute the pivotal supports of the stylus, which is a true two-armed lever. A piece of soft-rubber tubing 48 is inserted between the outer arm of this lever and the casing 31, and another piece of soft-rubber tubing 49 is slipped over the stylus between the elastic support 48 and the outer end. Thus it will be seen that the stylus is elastically supported and amply dampened, and that if the diaphragm vibrates under the impact of sound-waves the free end of the stylus will move to the right and to the left of its position of rest and parallel to the face of disk 13.

The disk 13 is preferably made of glass. It is of suitable diameter and thickness, and has two holes 12' 12', corresponding to the pins 12 12 projecting from flange 10, and is placed in position upon said flange with the pins entering the holes. The nuts 50 50 are then screwed down, whereby the glass disk is securely clamped.

The method of recording and reproducing recorded sounds by means of this apparatus will now be easily understood.

As has been stated above, the non-resisting material upon which the sound-record or phonautogram is produced is a semifluid, and I can use for this purpose any ink, as, for instance, printers' ink, of the required consistency. An even layer of this ink may be spread over the under surface of the glass disk in any suitable manner, as, for instance, by means of a brush or roller while the disk is slowly turned; but I prefer to produce the ink directly upon the disk itself, and I proceed in the following manner: The under surface of the glass disk is first carefully pol-

ished and dried, and is then covered with a thin film of oil by means of a camel's-hair brush. This is done while the disk is rotated with moderate speed. Any oil or fat may be used, but I have found linseed-oil specially adapted for the purpose. A smoky flame is then held under the glass plate while the latter is slowly rotated, whereby the lampblack ascending from the flame is intercepted by the plate and becomes deposited upon the same in a very fine layer, which, however, is instantly absorbed by and mixes intimately with the thin layer of oil, thus forming a black amorphous ink, covering the under surface of the glass disk in an even exceedingly thin layer. It is essential that the lampblack be deposited upon the oiled disk by the described process of sublimation; that is to say, the carbon particles must reach the disk and mix with the oil at the moment when their transition from the gaseous into the solid state takes place. If it were attempted to apply lampblack already formed by dusting upon the oiled disk, no intimate mixture resulting in an even layer of amorphous ink would be obtained. The coating of ink thus directly formed upon the disk has just the consistency and the thickness required. It will not flow spontaneously, and while it adheres well to the glass plate, it requires only a minimum force to remove it from the same, and the point of the stylus in its passage through the substance of the ink experiences no perceptible resistance. The disk is now ready to receive the phonautogram, and it is moved to the position shown in Fig. 1, with the point of the stylus near the outer edge. The point of the stylus is then adjusted into light contact with the disk, so that the coat of ink is barely penetrated by the same, and the weight 26 is allowed to descend and to rotate shaft 6 in the manner hereinbefore described. If now the stylus remained immovable, it would describe upon the under surface of the disk a smooth spiral the convolutions of which continuously decrease toward the center of the disk. The pitch of the spiral is determined by the pitch of the screw upon shaft 6 and by the relative angular velocities of said shaft and of bevel-gear 9, and may in practice be made as small as one-fiftieth of an inch. If now during the progress of the disk sound-waves are directed against the diaphragm through the mouth-piece 34 and tubes 33 and 32, the stylus will vibrate to the right and left of the spiral line, inscribing upon the disk an undulatory line of even depth, which line will truly and accurately represent the sounds uttered against the diaphragm. The stylus removes a very sharp line of ink from the disk, leaving the latter quite transparent at this line, while it is quite opaque and will not transmit light at the places not touched by the stylus. The ink removed by the stylus drops away from the disk, as stated above, and does not accumulate in and about the grooves.

An approximate idea of the phonautogram thus produced can be obtained by inspection of Fig. 9, which represents an undulatory spiral line upon a disk, with the pitch of the spiral and the undulations of the record greatly exaggerated. In the drawings, the undulatory line appears black upon a white ground, while in fact the line is transparent upon a black ground.

The phonautogram may extend to within a short distance from the edge of flange 10, and in practice the cords or chains 27 27 are made just long enough to drive the disk up to that limit, or the apparatus is mounted at the proper height above the ground so that the weight will be arrested before the limit of progress of the disk is reached. Bevel-gear 14 is then disengaged from bevel-gear 9 by unclamping the same from shaft 6 and sliding it upon the same a short distance to the left hand, (in the view shown in Fig. 1,) and the disk is then given a single rotation by hand, whereby the stylus describes a true circle 51 upon the disk. This circle, which I call the "centering-circle," is afterward utilized, as will presently appear. The glass disk, with the sound-record and centering-circle upon the same, is now removed, and the record may be fixed by applying a thin coat of varnish. It may then be handled with impunity. From this record I produce a copy in copper or any other metal by the process of photo-engraving, and in this process I use the original record as a negative, which enables me to work by transmitted light and with parallel rays, the negative being applied directly in contact with the sensitive photographic plate. The copy thus produced will have the exact size of the original, as is well understood by those skilled in the art. In the photo-engraved copy the sound-record appears as an undulatory line of even depth upon a solid metal disk, and the centering-circle 51 is reproduced in the same manner.

For reproducing the original sounds, the center of the centering-circle is determined by well-known simple geometrical constructions, and a small hole is drilled through that center, which hole corresponds to the mathematical axis about which the glass disk had been rotated, and also marks the axis about which the metal disk must be rotated by the apparatus shown in order that the pointed stylus applied to the starting-point of the record may follow the same from beginning to end. Two holes corresponding to the holes 12' 12' in the glass-disk are also made in the metal disk, but these holes are preferably made large enough to permit the disk to be adjusted in either direction when placed upon flange 10. Before this is done a well-fitting cylindrical block 52 is placed into that part of the cylindrical hole through the common center of flange 10 and bevel-gear 9 which is occupied by the head of screw 11, as shown in Fig. 8. This block, which I call

the "centering-block," has a fine axial hole 53, which corresponds exactly to the mathematical axis of rotation of bevel-gear 9. If now the photo-engraved copy of the record is placed upon flange 10, with pins 12 12 passing through corresponding holes in the metal plate, a fine pin, say a sewing-needle, is passed through the centering-holes in the disk and in block 52, and the clamp-nuts 50 are tightly screwed down. By this simple process the metallic copy of the original record is safely and quickly centered in position. The stylus is then adjusted with its point in engagement with the outer end of the record-groove, and the weight 26 is allowed to descend. It will now be clear that the stylus will be forced positively to follow the undulations of the record, and that the diaphragm vibrating under the stylus will emit the same sounds which produced the original record, which sounds can be distinctly heard at the ear-piece 34.

Both the process and the apparatus thus far described may be modified in various ways without departing from the main features of my invention. So, for instance, I can dispense with the centering device and can rotate the record upon a stationary axis, if the diaphragm with its attached stylus is mounted in a manner to make it follow the spiral record. An arrangement of this character is shown in Fig. 10. The reproducing-disk 54 is in this case mounted as hereinbefore described, but without regard to the centering device. The support 7' may be fixed in position so that the bevel-gear 9, mounted upon the same in the manner described with reference to Fig. 3, will turn without progressive motion. Bevel-gear 9, and with it the reproducing-disk 54, are rotated by a bevel-gear 14' upon a shaft 6', to which power is applied by a weight, as shown, or in any other suitable manner. The diaphragm-casing 31 is secured to a small truck 55 upon rails 56 arranged vertically above and parallel with a diameter of the reproducing-disk, and at such height above the same that the stylus 29 will be in engagement with the undulatory grooves of even depth which represent the record of sounds.

The listener applies his ear to the ear-piece, and when the shaft 6' is rotated the stylus and diaphragm will be forced to vibrate, as in the apparatus shown in Fig. 1, but will at the same time move with the truck 55 across the face of disk 54. A tolerably good reproduction may also be obtained by simply holding one end of a reed between the teeth and the other pointed end of the same in engagement with the record-grooves while the disk is rotated.

The frictional contact of the reproducing-stylus with the surface of the ordinary metallic record gives rise to disturbing sounds, and with a view of avoiding the same I mount the reproducing-disk 54 (see Fig. 11) upon a rigid plate 58, and with a sheet 57, of

felt, soft rubber, blotting-paper, or other non-sonorous substance intervening. This dampens the extraneous vibrations of the reproducing-disk and renders the sounds emitted by the diaphragm very clear.

Additional clearness is obtained by nickel-plating the metallic record, which is ordinarily made of copper, since I have found that the sound due to the frictional contact of the stylus with a polished surface of nickel is very faint.

In place of the metallic copy of the original record I can use a copy made of sealing-wax, which is made from a metallic or other copy having the record in raised lines. The metallic copy is for this purpose first oiled and the molten sealing-wax is then poured over it and is then backed by plaster-of-paris or other rigid material. The cast is then easily removed from the metallic matrix and may be used for the reproduction of the recorded sounds, which will be quite clear and remarkably free of the disturbing sounds due to the friction of the stylus, especially when the surface is first gently rubbed with plumbago.

The metallic copy of the original record is in effect an engraved copper plate, and it may be used as such for printing upon paper, which then yields a copy in raised lines, as is well understood, and from this paper copy the sealing-wax copy or a copy of any other similar material may be made.

I desire to emphasize the fact that my recording and reproducing stylus is a flat elastic strip, which will yield in one direction, but not in the other. For this reason the recording and reproducing surface need not be absolutely plane, and the stylus will still retain contact with the same, while it will be positively moved to follow the undulations of the record in reproducing. The point of the stylus may be made of iridium.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The method of producing a phonautogram, which consists in removing an undulatory line of even depth of a deposit of ink from a traveling plate, by and in accordance with sound-vibrations; substantially as described.

2. The method of producing a phonautogram, which consists in removing an undulatory line of even depth of a deposit of amorphous ink from a traveling support, by and in accordance with sound-vibrations; substantially as described.

3. The method of producing a transparent phonautogram, which consists in removing an undulatory line of even depth of a deposit of ink from a traveling plate of glass, by and in accordance with sound-vibrations; substantially as described.

4. The method of producing a transparent phonautogram, which consists in removing

an undulatory line of even depth from a deposit of amorphous and opaque material from a traveling support of glass, by and in accordance with sound-vibrations; substantially as described.

5. The method of producing a transparent phonautogram, which consists in removing an undulatory line of even depth extending along a volute, of a deposit of amorphous and opaque material from a rotating disk of glass, by and in accordance with sound-vibrations; substantially as described.

6. The method of producing a layer of semi-fluid ink upon a phonautographic support, which consists in first applying a coat of oil, or other fat, upon the support, and then sublimating upon the oiled surface a thin layer of lampblack; substantially as described.

7. The method of producing a phonautogram, which consists in removing an undulatory line of non-resisting material from the under surface of a traveling plate, by and in accordance with sound-vibrations; substantially as described.

8. In a gramophone, the combination of a sound-receiving sonorous body; with a pivoted stylus controlled by and controlling the same, and a support adapted to carry a phonautogramic recording-surface, or a copy of such record in solid resisting material, traveling in the plane of vibration of the point of the stylus; substantially as described.

9. In a gramophone, the combination of a sonorous diaphragm and a pivoted stylus; with an elastic connection between the diaphragm and stylus, and an elastic reactionary dampening-support for the free arm of the stylus; substantially as described.

10. In a gramophone, the combination of a pivoted stylus, with an elastic connection between the diaphragm and the stylus; substantially as described.

11. In a gramophone, the combination of a vibratory diaphragm and a stylus controlled thereby and controlling the same; with a rubber tube clamped to the diaphragm and connecting the stylus with the latter, and a pivoted support for the stylus between its free end and its connection with the diaphragm; substantially as described.

12. In a gramophone, the combination of a vibratory diaphragm and a stylus elastically connected therewith; with a pivoted support for the stylus located between the free end of the same and its connection with the diaphragm; dampening-washers between the stylus and its pivotal support, and a reactionary dampening-support for the free arm of the stylus; substantially as described.

13. In a gramophone, the combination of a horizontal traveling support for the record-surface; with a vibratory diaphragm, and a recording-stylus bearing upon the under surface of the support; substantially as described.

14. In a gramophone, the combination of a

metallic record of spoken words or other sounds; with a backing of non-resonant material; substantially as described.

15. In a gramophone, the combination of a
5 sound-receiving diaphragm, mounted in a suitable casing; with a tubular sound-conveying stem projecting from the casing, and an adjustable support for the tubular stem;
10 the connection between the casing and tubular stem being such as to permit of the rotation of the casing relative to the stem for adjustment, substantially as described and for the purpose set forth.

16. A device for centering a spirally-ex-
15 tending record, of sounds upon a reproducing

apparatus, consisting of a rotatable record-support having a central recess, a block fitting the said recess and having a perforation coincident with the mathematical center of rotation of the record-support, and means for
20 holding the record upon the support, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:

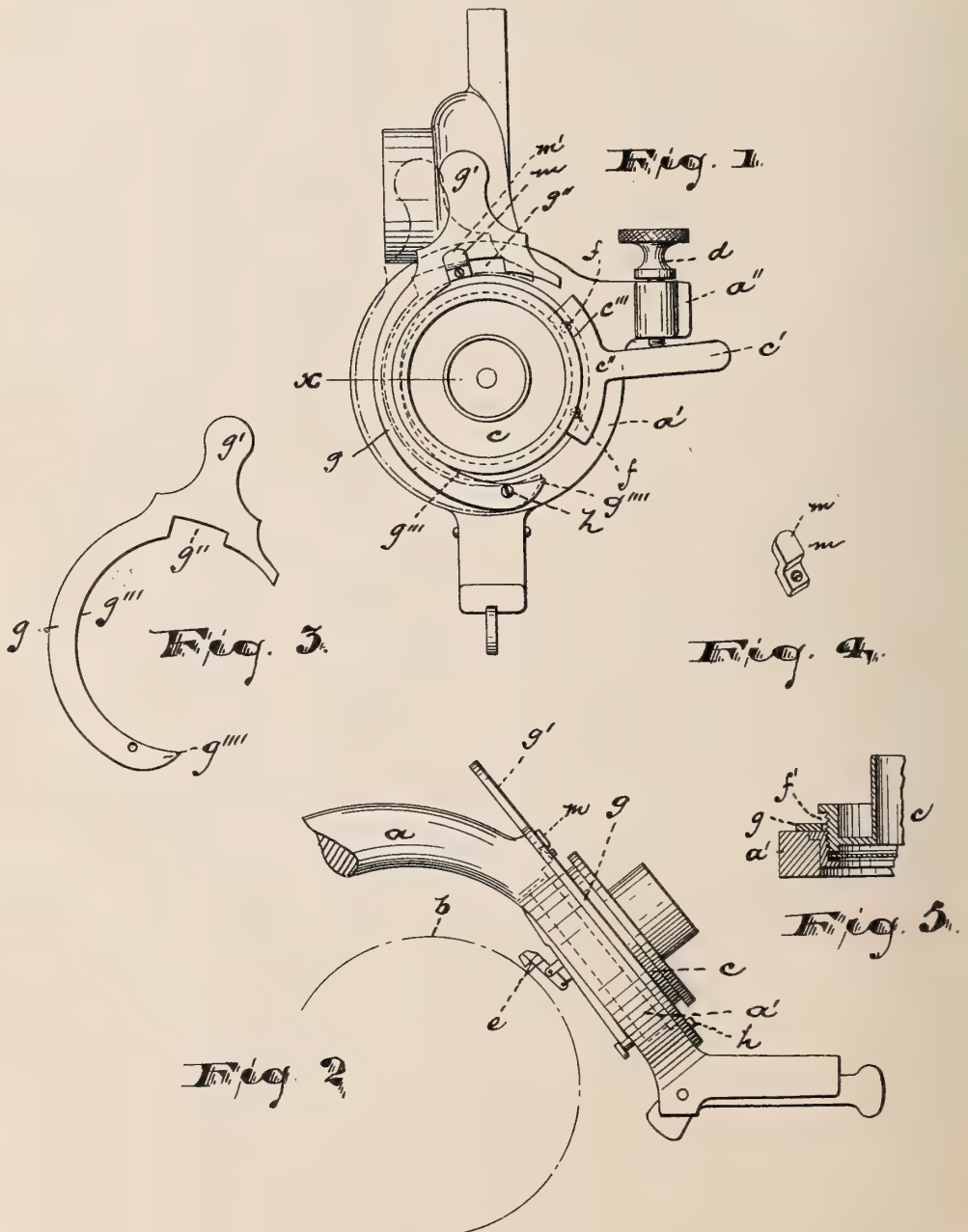
JACOB G. COHEN,
CHAS. W. HANDY.

(No Model.)

V. H. EMERSON.
DIAPHRAGM CLAMP FOR PHONOGRAPHS.

No. 567,738.

Patented Sept. 15, 1896.



WITNESSES:

INVENTOR

Robert Solberger
L. B. Pitney.

Victor H. Emerson,

BY Drake & Co. ATTY'S.

UNITED STATES PATENT OFFICE.

VICTOR H. EMERSON, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE UNITED STATES PHONOGRAPH COMPANY, OF SAME PLACE.

DIAPHRAGM-CLAMP FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 567,738, dated September 15, 1896.

Application filed December 20, 1895. Serial No. 572,753. (No model.)

To all whom it may concern:

Be it known that I, VICTOR H. EMERSON, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Diaphragm-Clamps for Phonographs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of this invention is to facilitate and render more convenient the operation of removing, replacing, and adjusting the diaphragm in and from its arm or carrier in the phonograph, whereby a material saving of time is effected, especially when the operator is before an audience and desires to reproduce audible expressions immediately after they are rendered, all in the presence of said audience.

The invention consists in the improved phonograph, in the improved diaphragm arm or carrier for the same, and in the arrangements and combinations of parts, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters indicate corresponding parts in each of the figures, Figure 1 is a plan of a diaphragm arm or carrier of a phonograph embracing my improvements. Fig. 2 is a side elevation of the same. Fig. 3 is a detail plan of a clamp or holder for securing the diaphragm in position on the arm or carrier. Fig. 4 is a perspective view of a clip for holding the free end of said clamp or holder, and Fig. 5 is a sectional detail on line *x*.

In said drawings, *a* indicates an ordinary diaphragm-holding arm or carrier having the usual relation with the cylinder *b*. (Shown in outline in Fig. 2.) At its forward end the said arm is provided with the annular seat *a'*, in which the diaphragm *c* may be arranged. Said diaphragm *c* is also of usual construction. It may be such as will engrave the cylinder *b* when audible sounds are directed against it or will be operated upon by a cyl-

inder already engraved to effect a reproduction of such sounds. The said diaphragm *c* is provided with an outwardly-projecting finger-piece *c'*, adapted to serve in lifting said diaphragm from its seat. It also acts as a guide, in connection with an adjusting-screw *d*, by which the said diaphragm may be directed into proper relation to its seat to bring the retracing or reproducing point in proper operative position. It also acts somewhat similarly in connection with the terminal projection *g''''* of the clamp *g*, as will be hereinafter described. The adjusting-screw *d* has its bearings in an extension *a''* of the arm *a*, said extension being provided with a female thread to receive said screw, as will be understood. Said finger *c'* is formed in a plate *c''*, integral with a segmental flange *c'''*, said plate being fastened by screws *f* upon the diaphragm, so that the concavous edge of the segmental portion will lie against the peripheral sides of the diaphragm and on a shoulder thereof, and thus, when screwed, be firmly and with exactness held in position in a plane with a clamp next to be referred to. At the opposite side of the annular portion of the arm *a* the same is provided with a semiannular or curved clamp *g*, consisting of a piece of sheet metal corresponding in thickness, more or less closely, with the thickness of the plate *c''*. Said clamp is adapted to be moved laterally with respect to the diaphragm to and from the peripheral sides of the same to enter the groove or peripheral recess *f'* of the said diaphragm and provide a holding-lip for the same, as shown in Fig. 5. At one end, as at *h*, said curved clamp is pivoted on the face of the arm, and at its opposite end it is provided with an outwardly-projecting finger extension or handle *g'* and also a recess *g''* in from its inward concavous edge *g'''*. The annular portion *a'* is also provided with a limiting-clip *m*, Figs. 1 and 4, which is seated so as to lie in the recess *g''* and limit the oscillating movements of the clamp to and from the diaphragm. Said clip is bent as shown in Fig. 4, and at its projecting end overlies the clamp *g*, so that the latter is prevented from being raised from the face of the arm and thus being bent or rendered inoperative. By simply turning the clamp on

its pivot away from the diaphragm the latter can be raised from its seat and be removed. A reverse action after inserting the diaphragm in its seat holds the said diaphragm with sufficient firmness and security in place. 5 The clamp extends a little beyond its pivot and forms at g'''' a guide or stop to engage the nearest end of the segmental portion c'' of the plate c'' lying in plane therewith when 10 the diaphragm is employed in recording sound in connection with the ordinary style. The clamp is held where placed in any of its adjustments by friction, the several parts being close-fitting to secure a limited binding 15 sufficient for the purpose. The projecting arm m' of the clip bears on the clamp g with a resilient pressure whereby, an even frictional contact is obtained at the free or handled end thereof.

20 I am aware that the construction of the device can be modified and the arrangement of parts varied without departing from the invention, and consequently I do not wish to be understood as limiting myself by positive terms employed in describing the construction, excepting as the state of the art 25 may require.

Having thus described the invention, what I claim as new is—

30 1. The combination, in a phonograph, with the arm, having the annular portion and the diaphragm, of a diaphragm-clamp comprising a curved piece pivoted to said arm and having a movement to and from the periphery 35 of the diaphragm, substantially as and for the purposes set forth.

2. The combination, in a phonograph, with the diaphragm-arm a , and diaphragm c , of the pivoted and curved clamp g , and clip m , substantially as and for the purposes set forth. 40

3. In a phonograph, the combination with the diaphragm-arm a , and diaphragm c , of a

pivoted, curved and recessed clamp and a clip m , arranged in the recess of said clamp, substantially as set forth. 45

4. In a phonograph, the combination with the diaphragm-arm a , and diaphragm c , of a pivoted diaphragm-clamp, arranged and operating, substantially as set forth.

5. In a phonograph, the combination with 50 the diaphragm-arm a , and diaphragm c , of a diaphragm-clamp arranged on said arm, and having a limited movement to and from holding contact with the diaphragm, substantially as and for the purposes set forth. 55

6. In a phonograph, the combination with the diaphragm-arm, having the annular portion in which is seated the removable diaphragm, of a clamp pivoted on said arm at one end, intermediately curved to engage 60 the periphery of the diaphragm, and at the opposite free end having a finger g' and means for holding said free end down upon said arm, substantially as set forth.

7. In a phonograph, the combination with 65 the diaphragm-arm, a , and diaphragm c , of a pivoted clamp g , having a finger-piece g' , recess g'' , concavous edge g''' , and an extension g'''' , serving as a diaphragm-stop, substantially as set forth. 70

8. In a phonograph, the diaphragm-clamp, consisting of the concavous portion g , having the outwardly-extending finger-piece g' , a limiting-recess g'' and a diaphragm-stop extension g'''' , near its pivoted end, said parts 75 being combined substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 12th day of December, 1895.

VICTOR H. EMERSON.

Witnesses:

CHARLES H. PELL,
C. B. PITNEY.

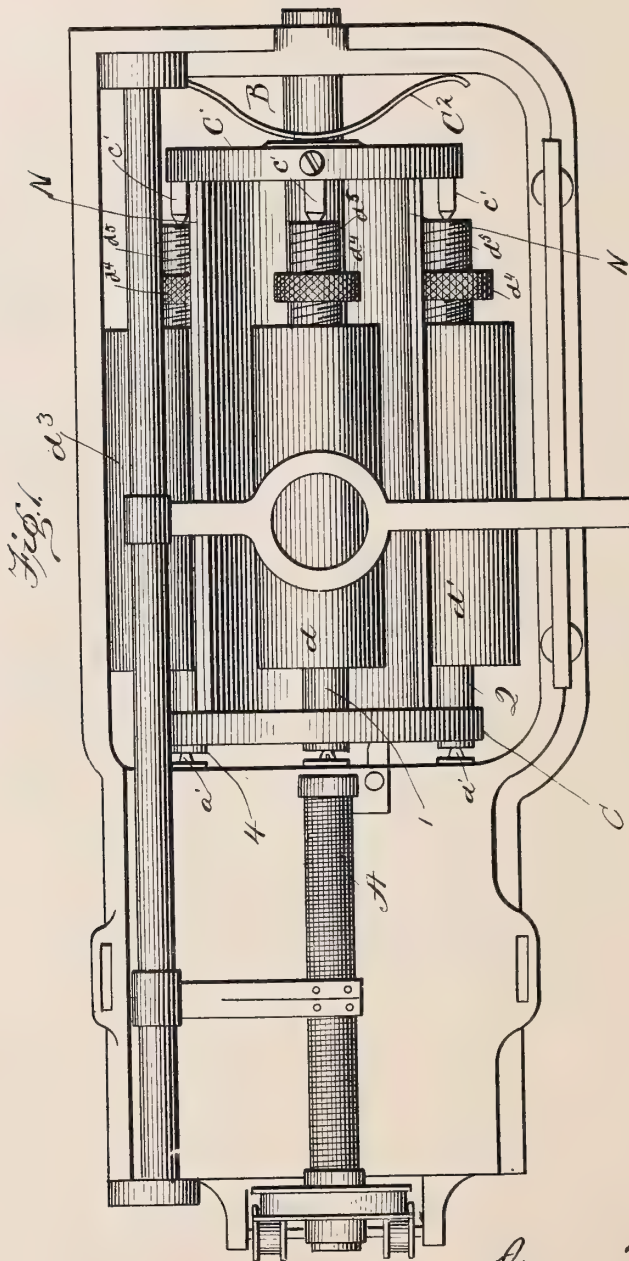
(No Model.)

3 Sheets—Sheet 1.

G. W. MOORE.
PHONOGRAPH.

No. 568,116.

Patented Sept. 22, 1896.



Witnesses.

J. M. Fowler Jr.
W. I. Castle

George W Moore
Inventor.

By Stockman & Welch
Attorneys.

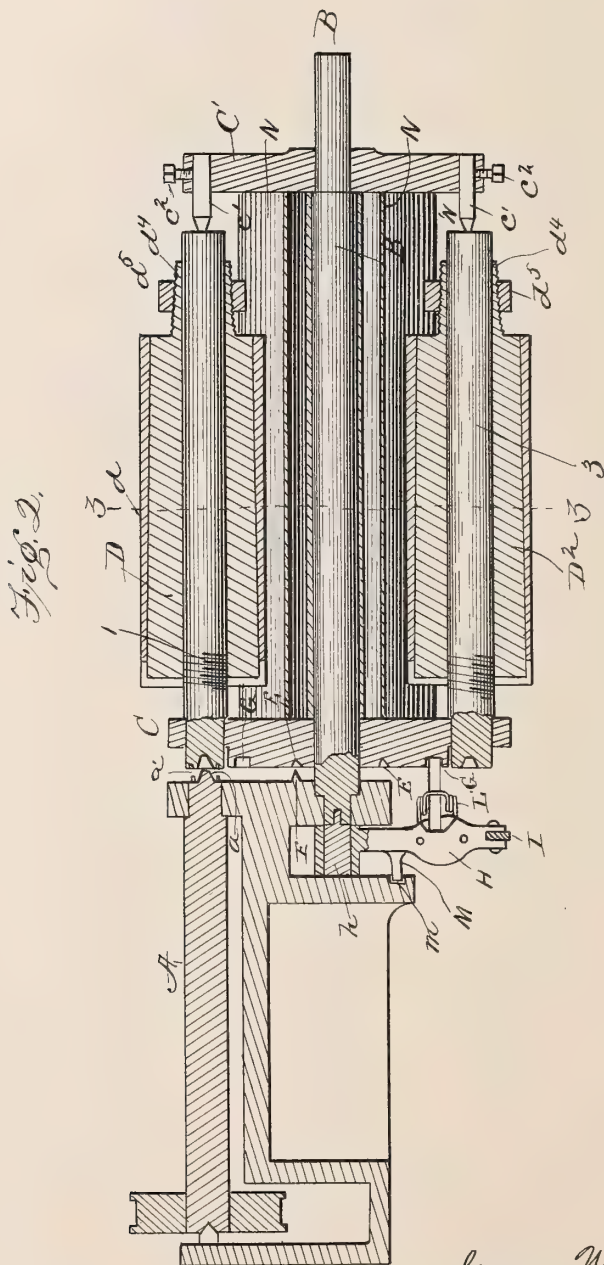
(No Model.)

3 Sheets—Sheet 2.

G. W. MOORE.
PHONOGRAPH.

No. 568,116.

Patented Sept. 22, 1896.



George W Moore

Inventor:

Witnesses:

J. M. Fowler Jr.
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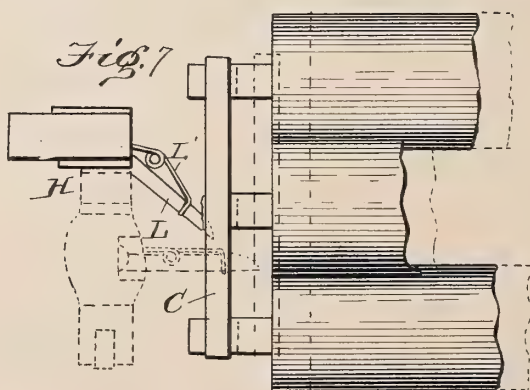
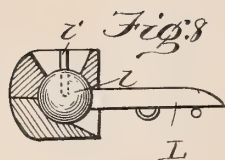
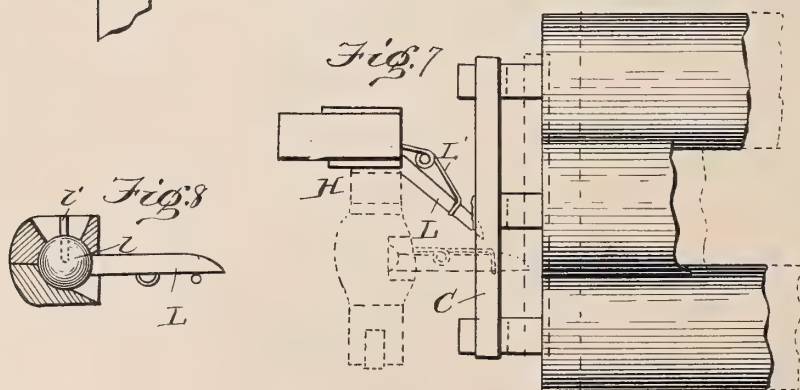
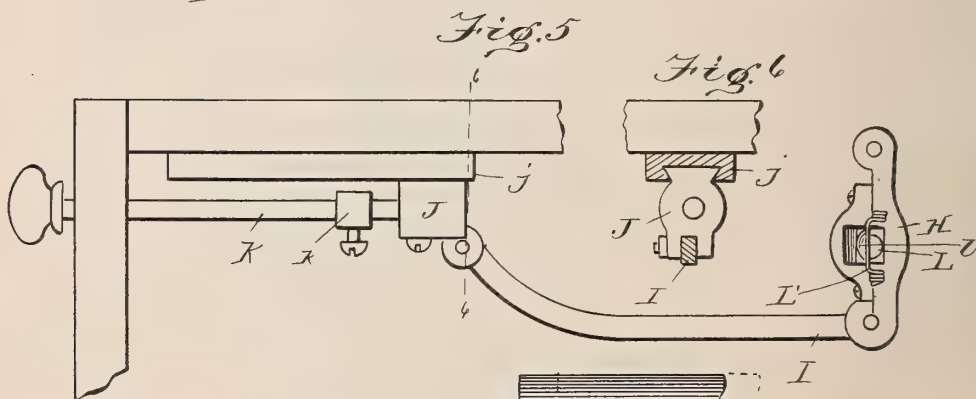
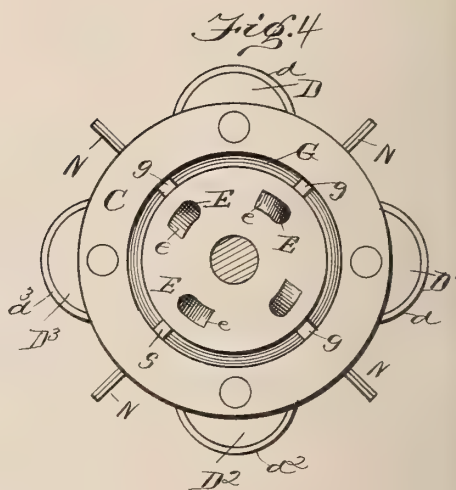
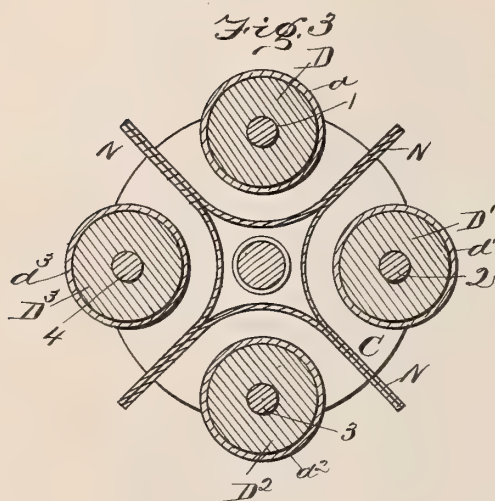
(No Model.)

3 Sheets—Sheet 3.

G. W. MOORE.
PHONOGRAPH.

No. 568,116.

Patented Sept. 22, 1896.



Witnesses:
J. M. Fowler Jr.
W. I. Castle

G. W. Moore
Inventor.

By Stockman & Welch
Attorneys.

UNITED STATES PATENT OFFICE.

GEORGE WASHINGTON MOORE, OF ATLANTA, GEORGIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 568,116, dated September 22, 1896.

Application filed May 11, 1895. Serial No. 548,954. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WASHINGTON MOORE, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Phonographs; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention has relation to phonographs, graphophones, or other sound recording and reproducing instruments; and it has for its object, generally, to improve the construction of the means heretofore employed for supporting a plurality of phonogram-cylinders, so that any one of them may, by the movement of the lever, be brought into operative relationship with the rotary device of the apparatus and take the place of the one previously engaged herewith.

The specific objects and the advantages of the invention will readily appear from the following description.

The invention consists in certain peculiarities in the construction, arrangement, and combination of the several parts substantially as hereinafter described, and particularly pointed out in the subjoined claims.

In the accompanying drawings, illustrating the invention, Figure 1 is a plan view of part of a phonograph embodying my improvements with one of the shafts carrying the phonogram-cylinders in operative relationship with the main operating-shaft. Fig. 2 is a vertical sectional view thereof with all of the phonogram-cylinder shafts out of engagement with the main operating-shaft. Fig. 3 is a sectional view taken on the line 3 3 of Fig. 2. Fig. 4 is an end elevation of the forward disk and the cylinders and their shafts. Fig. 5 is a side view of the lever mechanism for operating the cylinders to bring one of the latter out and another into operative relationship with the main operating-shaft. Fig. 6 is a sectional view on the line 6 6 of Fig. 5. Fig. 7 is a detailed view of parts of the phonogram-cylinders and le-

ver mechanism therefor, showing in dotted lines the position of the parts when said lever mechanism has pushed said cylinders longitudinally upon shaft B. Fig. 8 is a detailed view showing the connection of dog L with lever H. Fig. 9 is an end view of one of the shafts supporting a phonogram-cylinder, showing the series of openings therein.

The same letters and figures of reference designate the same parts in the several views.

A designates the shaft of a phonograph, graphophone, or other sound recording and reproducing machine, which shaft is driven by the usual or any suitable means and revolves the phonogram-cylinder for the purpose of recording sound-waves thereupon or of reproducing the recorded sound-waves.

B designates a stationary bar or axle upon which is mounted a frame embodying two disks C and C', that are movable longitudinally upon, as well as being rotatable around, said bar or axle. These disks support the journaled shafts 1, 2, 3, and 4, to which are respectively secured the tapered cylinders D, D', D², and D³, which carry the tablets d, d', d², and d³, upon which the sound-waves are recorded. One end of each of said cylinders has a threaded engagement with its shaft, while its opposite end is provided with a split and tapered threaded thimble d⁴, which embraces the shaft and is held closely thereto by a threaded nut d⁵. This construction is very advantageous, because it enables the cylinders to be most nicely and accurately adjusted upon their respective shafts and rigidly held in their adjusted position. The extremities of the shafts are also formed with tapering recesses, of which those at one end receive the tapering ends of pins c' and those at the other end receive pins a and a', projecting from the adjacent end of the rotating shaft A. It will be obvious that when one of the shafts 1, 2, 3, and 4 is attached to the shaft A, the former with its cylinder and tablet is revolved with the latter, while the others of said first-mentioned shafts remain stationary. The pins c' serve as center-pins, and upon them the respective shafts 1, 2, 3, and 4 rotate, and said center-pins are removably attached to the disk C' by screws c². If it is desirable or necessary to change the cylinder, such change may be accomplished,

after the shaft and cylinder have been removed from the machines, by unscrewing nut c^2 and the cylinder in the order named, and by screwing another cylinder upon the shaft and a nut upon the thimble thereof. The axle B is also removably supported in position, as will readily be seen by an inspection of the accompanying drawings.

To remove a cylinder and its shaft from the machine, it is only necessary to release the center-pin engaging one end of said shaft from engagement with its screw c^2 by loosening the latter, and then to slide the cylinder and its shaft endwise until said shaft is disengaged from the driving-shaft, which movement is permitted by reason of the fact that the center-pin may now slide outward within its opening in disk C'.

The series of circularly-arranged recesses in the end of each shaft 1, 2, 3, and 4, that receive the pin a' , projecting from shaft A, are set closely together, as shown in Fig. 9, and they are preferably reamed out, so that the walls between them present sharp edges, as by such construction the pin a' will be caused unfaillingly to enter one of said recesses when the shaft provided with the latter is brought into operative relationship with the shaft A, provided with the former.

Disk C is provided with a plurality of recesses E, corresponding in number and position with the phonogram-cylinders, as clearly shown in Fig. 4. Said recesses receive, one at a time, a tapered projection F, extending from the adjacent part of the frame of the phonograph. A suitable spring C^2 , preferably of the form shown, engages disk C' and exerts a pressure which keeps the pins and recesses above mentioned normally in engagement with each other. Arranging the spring C^2 so that it presses the disks and the parts carried thereby toward the driving-shaft is productive of important advantages, in that with such construction one spring only is necessary and the lever mechanism need only be of such nature that it will force the disks, &c., first longitudinally to disengage the pins and recesses from each other and then rotatively until the shaft of the desired cylinder is opposite the main driving-shaft.

The means for effecting the combined movement of the disks and parts carried thereby will now be described.

Formed in the face of disk C is a circular groove G, within which are a series of teeth g , corresponding in number with the number of phonogram-cylinders employed and relatively so arranged in the groove G as respectively to register with the space between two cylinders.

H designates a normally vertical lever, the upper end of which is loosely sleeved upon a stud h , projecting from the phonograph-frame and the lower end of which is connected with an approximately horizontal pivoted link I, having a slide J, which travels in guides j , secured to the under side of the phonograph

table or support, and is provided with the outwardly-extending operating-handle K. A dog L projects diagonally from said lever into the groove G in the disk C, and a projection M enters a groove m in the phonograph-frame and guides the lever in its movement. The dog L is secured to the lever H by a ball-and-socket or other suitable joint l , which will enable its free end to travel freely in the circular groove G, and to said ball is secured one end of a pin l' , the other end of which extends through a slit in the socket, so that the dog will thereby be prevented from turning out of position, which would disengage it from said groove. The dog is also engaged by a spring L' of suitable construction, which tends to hold its free end within groove G, so that it will accomplish its function more efficiently, and at the same time permits it to move upon its joint l .

From the foregoing the operation of my invention will be readily understood to be as follows: In Fig. 1 shaft 1 is shown engaged with shaft A. When it is desired to bring another shaft, as, for example, 2, into operative relationship with said operating-shaft, the operator pulls handle K toward him, thus turning lever H upon its fulcrum and causing dog L first to traverse groove G until it is brought into engagement with the adjacent tooth g , and then gradually to overcome the power of spring C^2 and turn upon its joint l and assume a position at substantially right angles with said lever H, thereby forcing said disks C and C' longitudinally upon axle B and disengaging said cylinder-shaft 1 from the driving-shaft and disk C from projection F. Further outward movement of the handle rotates said disks around said axle and brings the next shaft 2 in line with the driving-shaft. At this point movement of the handle may be automatically stopped by any suitable means, such as the adjustable collar k , arranged to engage the frame of the machine. A spring will preferably be provided, so arranged that the operator may now release the handle and the lever mechanism will automatically be returned to its original position. During this return movement of the lever mechanism the free end of the dog moves backward in the groove G and rides over the next succeeding tooth g and stops in position which will enable it to engage said tooth when another cylinder is to be brought into operation. When the handle is released, spring C^2 forces the disks longitudinally toward the driving-shaft and pins a , a' , and F are caused to engage their respective recesses in the end of said shaft 2 and face of disk C.

The pin F and recess E above referred to are important and advantageous elements of my construction, as they coact to turn the disks, &c., so as to bring the pins of shaft A into direct alinement with the recesses in the adjacent cylinder-shaft 1, 2, 3, or 4 when the latter is brought to within, say, one-sixteenth of an inch of its proper position by the means

above specified. In order to cause said pin F positively and properly to engage said recess E when the latter is brought to it by the rotation of the disk, said pin is made considerably longer than pin *a* on shaft A, and supplemental recesses *e* are formed in the face of disk C. These supplemental recesses are arranged concentric with recess G and communicate, respectively, with the recess E and are of gradually-increasing depth from their outer ends to the recesses E.

N designates shields which are arranged to partly encircle the cylinders and serve to keep the particles of wax cut from one cylinder from falling onto another. These shields extend throughout the whole length of their respective cylinders and empty their contents when their mouths open downward.

While I have shown four cylinders, I wish it understood that the use of any number more than one is contemplated by me. I also wish it understood that while the construction herein shown and described is preferred by me to all others with which I have experimented, yet many of its details may be varied without departing from the spirit of my invention, and the liberty to vary such details I therefore reserve to myself.

Having now described my invention, what I believe to be new, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, the combination with the driving-shaft, having pins projecting from one end, an axle, disks rotatably and slidably mounted upon said axle and formed with recesses and supplemental recesses, said supplemental recesses communicating with said first-mentioned recesses and being of gradually increasing depth, a pin designed to engage said recesses, and the cylinder-shafts, carried by said disks and formed with recesses to receive the pins of the driving-shaft, substantially as described.

2. In a sound recording and reproducing machine, the combination with the driving-shaft, of the journaled cylinder-shaft, having means for locking it to said driving-shaft and exteriorly threaded near one end, the cylinder adjustably mounted upon said cylinder-shaft and revolved therewith, said cylinder having threads at one end engaging the threads of its shaft and being provided with a split and tapered thimble at its other end through which said shaft extends, and a threaded nut engaging said thimble and forcing the same against said shaft, substantially as described.

3. In a sound recording and reproducing machine, the combination with the driving-shaft, the cylinder-shaft, detachably engaged with said driving-shaft and threaded near one end, and the slidably-supported center-pin, of the cylinder, threaded at one end to engage said threaded end of its shaft and having its other end provided with a split tapered thimble having threads on its outside,

and the threaded nut engaging said thimble, substantially as shown and described.

4. In a sound recording and reproducing machine, the combination of a plurality of phonogram-cylinders, and shields partly encircling said cylinders and preventing the wax cut from one from dropping into another, substantially as described.

5. The combination with the driving-shaft of a sound recording and reproducing machine, of an axle, disks rotatably and slidably mounted upon said axle, one of said disks having a circular groove and teeth in said groove, a spring engaging one of said disks, cylinder-carrying shafts carried by said disks and provided with means for locking them to said driving-shaft, a dog the end of which is adapted to traverse said groove and to engage the teeth, and a lever to which said dog is jointed, substantially as described.

6. In a sound recording and reproducing machine, the combination with the driving-shaft, the rotatable and slidable disks, one of said disks having a circular groove provided with teeth, a spring engaging the other disk, and the cylinder-shafts designed to be detachably locked to said driving-shaft, of a pawl engaging said groove and teeth, and means for operating said pawl to move said disks and shafts away from the driving-shaft and then to rotate them, substantially as described.

7. In a sound recording and reproducing machine, the combination with the driving-shaft, an axle, a frame loosely mounted upon said axle, a plurality of phonogram-cylinders carried by said frame, and means for locking said cylinders one at a time to said shaft, of mechanism for bringing a different cylinder into operative relationship with said shaft, consisting of a lever mechanism for forcing the frame longitudinally upon the axle to disengage the cylinder from the shaft and then move it rotatively around said axle until the proper cylinder has been brought opposite said shaft, and a spring engaging the end of the frame remote from the driving-shaft and operating to press said frame toward said shaft, substantially as described.

8. The combination with the driving-shaft, having pins *a* and *a'* projecting from one of its ends, of the longitudinally-movable and rotative frame, and the phonogram-cylinder shafts carried by said frame and each having in one end a main recess to receive pin *a* and a circular series of closely-set recesses to receive pin *a'*, substantially as described and for the purpose specified.

9. The combination with the driving-shaft of a sound recording and reproducing machine, of the rotative and slidable plates carrying a plurality of phonogram-cylinders, one of said plates having recesses corresponding in number with the number of phonogram-cylinders, and also having supplemental recesses of gradually-increasing depth communicating with said first-mentioned recesses, a

projection from the phonograph-frame designed to enter said recesses, and means for pressing the plates toward said projection, substantially as described.

5 10. The combination with the driving-shaft of a sound recording and reproducing machine, disks rotatably and slidably mounted upon said axle, one of said disks having a circular groove and teeth in said groove, cylinder-carrying shafts carried by said disks and provided with means for locking them to said driving-shaft, a pivoted lever, a dog having a ball-and-socket connection with said lever, a spring engaging said dog, and an operating-handle connected with said lever substantially as specified.

11. In a sound recording and reproducing machine, the combination with a longitudinally-movable and rotative frame provided with plurality of cylinder-carrying shafts, of a lever mechanism for moving said frame longitudinally and rotating it, said lever mechanism embodying a dog having one end engaged with said frame, a pivoted lever to which the other end of said dog is jointed, and an operating-handle for said lever substantially as specified.

12. In a sound recording and reproducing machine, the combination with a rotative frame carrying a plurality of cylinder-supporting shafts, and with the phonograph-table having guides, a slide traveling in said guides, a lever connected with said frame, a link connecting the lower end of said lever with the slide, and a handle for operating said slide.

13. In a sound recording and reproducing machine, the combination of the table having a groove *m*, a frame carrying a plurality of cylinder-supporting shafts, said frame having one of its ends formed with a groove provided with teeth, an axle upon which said frame is loosely mounted, a lever having a projection extending into said groove in the table, a normally-inclined dog pivoted to said lever and extending into the groove in said frame, and mechanism operating said lever to cause the dog first to assume a horizontal position and then to turn, substantially as described.

14. In a sound recording and reproducing machine, the combination of a spring-pressed frame, provided with a plurality of cylinder-carrying shafts and rotatably and slidably mounted upon its support, said frame having

its end remote from the spring provided with teeth, a normally-inclined dog engaging said teeth, and means for causing said dog first to assume horizontal position and then to turn, substantially as described.

15. In a sound recording and reproducing machine, the combination of the frame, the driving-shaft, the revoluble disks, the journaled cylinder-shafts carried by said disks, and a projection from the frame, the inner ends of the cylinder-shafts being formed to present locking-surfaces to the adjacent end of the driving-shaft, and the inner of said disks having recesses coöperating with said projection to guide the cylinder-shafts into engagement with said driving-shaft.

16. In a sound recording and reproducing machine, the combination with the frame, the driving-shaft, the revoluble disks, the journaled cylinder-shafts, carried by said disks and having their inner ends formed to lock with the adjacent end of the driving-shaft, and a lever mechanism for bringing a different cylinder to the driving-shaft, of a spring and guiding means operating to cause the cylinder-shaft brought adjacent to the driving-shaft to engage the same.

17. The combination with the revoluble and slidable frame, the plurality of cylinders carried thereby, and the spring pressing said frame in one direction, of a lever, an operating-handle connected with said lever, and a dog, one end of which engages the end of the frame remote from the spring and the other end of which has a ball-and-socket connection with said lever, said dog having a pin extending through a slot in the wall of the socket, for the purpose specified.

18. The combination with the slidable and revoluble frame, the plurality of cylinders carried thereby, and the spring pressing said frame in one direction, of a lever, an operating-handle therefor, a dog one end of which engages the end of the frame remote from the spring and the other end of which has a ball-and-socket connection with said lever, a spring engaging said dog, and a pin extending from the ball through a slot in the wall of the socket, for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE WASHINGTON MOORE.

Witnesses:

HENRY S. CAVE,

FRANK E. WELCH.

(No Model.)

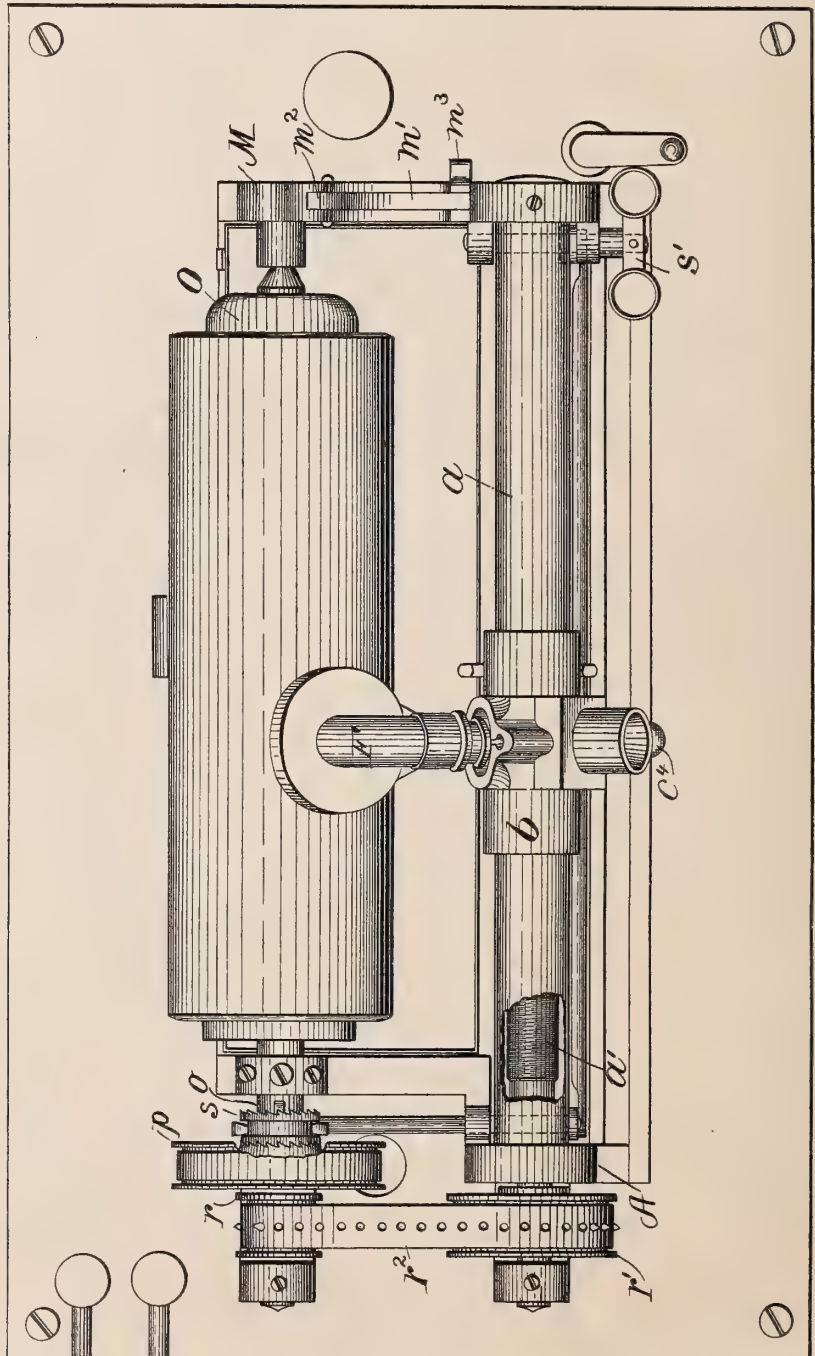
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T. H. MACDONALD.
GRAPHOPHONE.

No. 569,290.

Patented Oct. 13, 1896.

Fig. 1.



Witnesses.
W. Ross Edley.
Jesse Lewis

Inventor.
Thomas H. Macdonald
by J. L. Adams
his attorney.

(No Model.)

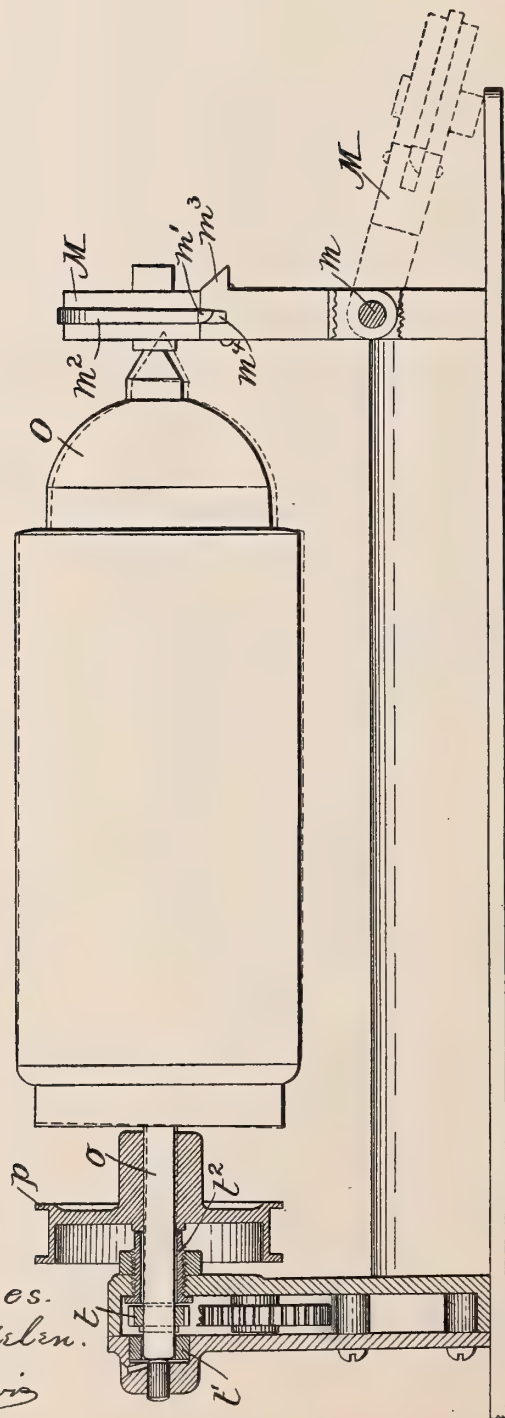
T. H. MACDONALD.
GRAPHOPHONE.

3 Sheets—Sheet 2.

No. 569,290.

Patented Oct. 13, 1896.

Fig. 2.



Witnesses.
W. Ross Edelen.
George Lewis

Inventor.
Thomas H. Macdonald
by *Salcedo Mauro*,
his attorney.

(No Model.)

3 Sheets—Sheet 3.

T. H. MACDONALD.
GRAPHOPHONE.

No. 569,290.

Patented Oct. 13, 1896.

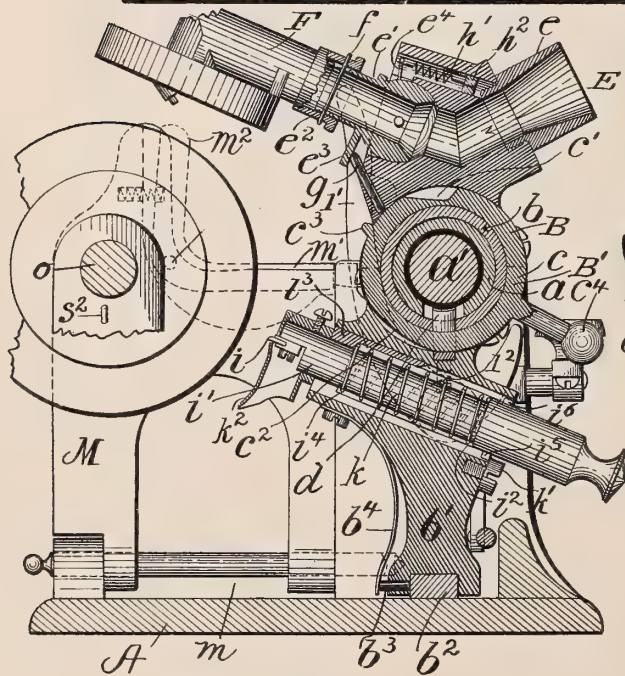
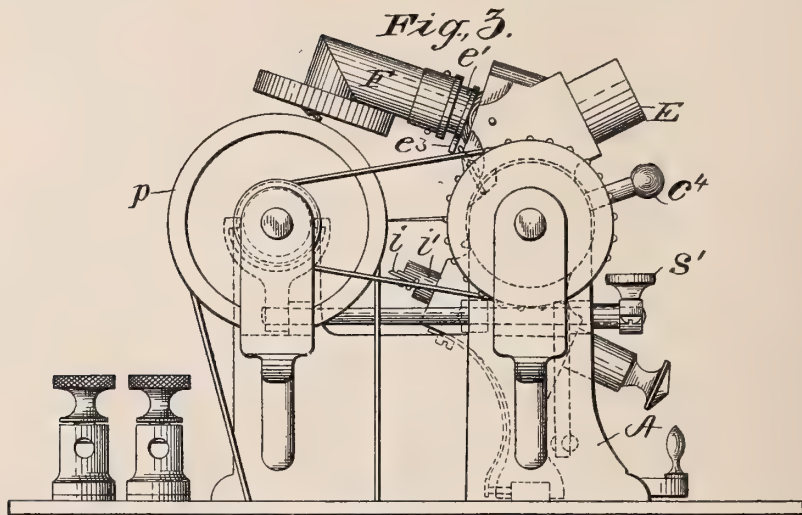


Fig. 4.

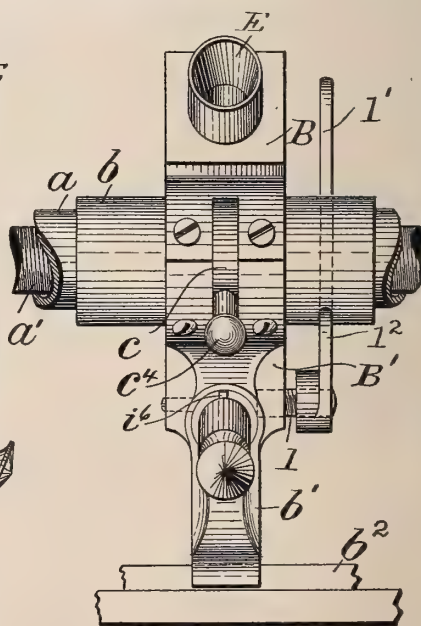


Fig. 5.

Witnesses,
W. Burr Edelin.
J. W. Lewis

Inventor,
Thomas St. Macdonald
by John Mauro
his attorney,

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 569,290, dated October 13, 1896.

Application filed November 2, 1895. Serial No. 567,729. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Graphophones, which are fully set forth in the following specification.

This invention relates to apparatus for recording and reproducing sounds, generally known as "graphophones," and its object is to improve such apparatus in point of efficiency and convenience in use.

The present improvements relate more particularly to the carriage which supports the recorder and reproducer, (and also the shaving-knife, when one is employed,) to the support of the mandrel or tablet-holder, and to the starting and stopping mechanism.

The carriage slides, as heretofore, on a tube fixed rigidly in the side frames and inclosing the feed-screw. A handle and a device (such as a cam) actuated thereby are provided, one movement of which both lifts the reproducer or recorder from contact with the record-cylinder and also disengages the feed-screw. This improvement has several advantages. It avoids the necessity of touching the recorder or reproducer for the purpose of putting them into and out of operative position, it provides a positive lock for the recorder or reproducer when out of position and permits them to be let down easily upon the record, (the pitch of the cam being gradual,) and it furnishes a handle by which the carriage and parts supported by it can be slid along the guide-tube.

Heretofore one bearing of the mandrel or tablet-holder has been carried by a vertically-pivoted swinging arm, and a locking device has been provided to lock this arm in place, two movements being required. Such swinging arm has a journal-bearing on one end only, and it has been found in course of time that through wear on this bearing the perfect alinement of the arm is disturbed, resulting in a corresponding alteration of alinement of the mandrel. This defect is avoided by the swinging gate hereinafter described. Furthermore, through carelessness or inattention the user of the instrument often fails to swing the arm completely around, and consequently in removing the fragile record-cylin-

der from the mandrel its end or side strikes the arm and is broken or marred. This has been a fruitful source of broken records. According to this invention the movable bearing of the tablet-holder is carried by an end gate, which when unlocked and partly turned will fall by its own weight down and which automatically locks itself when raised into position.

Special improvements in the construction of the latch are provided whereby a tight connection is insured and rattling prevented.

Another improvement consists in arranging a bearing close to the fixed end bearing of the mandrel, with which intermediate bearing the shaft of the mandrel is ordinarily not in contact. When, however, the end gate or support is removed and the mandrel is unsupported at that end, its shaft is brought by the weight of the mandrel into contact with the intermediate bearing, which thus acts as a brake and stops the shaft. Thus the withdrawal of the support at one end of the mandrel for the purpose of removing and replacing a cylinder automatically arrests the mandrel. This improvement is useful in small machines driven by spring-motors easily arrested by friction and would not be employed with electric motors.

The ordinary start and stop mechanism has been improved to give the clutch a double action, so that in one position it engages the mandrel with a running shaft and in the other not only disengages it, but positively stops and holds it. This improvement has been found advantageous because with heavy tablets the momentum would keep the tablet and cylinder in motion after disengagement of the same by the clutch.

In the accompanying drawings, illustrating what is deemed the best embodiment of my improvements in a practical machine, Figure 1 is a plan view; Fig. 2, a front elevation, partly in section, showing a different form of driving-gearing; Fig. 3, an end elevation from the left of Fig. 1. Fig. 4 is a transverse sectional view through the carriage, and Fig. 5 is a detail in elevation of the carriage.

Referring to the drawings, A represents the frame, supporting at its front the usual guide-tube *a*, longitudinally slotted on its under

side and inclosing the feed-screw a' . Sleeve b , constituting part of the carriage, encircles and slides upon tube a . To facilitate the assembly of the parts, the carriage proper is divided into an upper part B and a lower part B', each having a semicircular seat resting against and together surrounding the tube, to which they are fastened by suitable screws. A leg b' depends from the carriage and is forked at its lower extremity to embrace a rail b^2 on the frame A. To take up all wear and insure a close contact of the rail and leg b' , thereby preventing even the slightest oscillation of the carriage, which would be detrimental to the perfect operation of the recorder or reproducer carried thereby, a pin b^3 , pressed by a spring b^4 , passes through an opening in the leg and bears against the side of the rail.

A ring c , having cam-surfaces c' c^2 and a projection c^3 on its periphery, is arranged concentrically about and bears against the sleeve b and has an operating-handle c^4 . This ring is arranged at about the middle of the tube and works in suitable recesses or grooves in the parts B and B' of the carriage, as clearly shown in the drawings. A divided segmental nut d for communicating movement from the feed-screw a' to the carriage is located in a recess in the bottom of the semicircular seat on the lower part B' of the carriage and projects upwardly through the sleeve b , at the same time spanning the ring c , against which it is held by spring-pressure, said pressure also holding it in engagement with the feed-screw during the operation of the machine.

A sound-conducting passage E through part B of the carriage has at its front end a nozzle e for the rubber tube (not shown) and at its rear end a pivoted tubular joint e' , over which the recorder or reproducer F is adapted to slip in a definite position determined by cross-bar f and notches e^2 .

g is a pintle sliding in a suitable way, bearing at one end against a projection e^3 on the joint e' and at its other end against the peripheral surface of the ring c , whereby it is moved to lift the reproducer or recorder when desirable, as hereinafter described. An opening h is bored through the metal of the frame above and opening into the passage E at one end, in which is housed a very sensitive spring h' , secured to a plug h^2 at one end and at its other end connecting with a pin e^4 on the joint e' , projecting into the opening. Such an arrangement is desirable when the weight of the recorder or reproducer is excessive, to regulate the pressure with which the instrument in use rests against the tablet.

In describing the operation of the improvements above referred to I will first call attention to the stop action of the projection c^3 , limiting movement of the ring c by engagement with the parts B' and B of the carriage when in the positions shown in Figs. 3 and 4, respectively. In the latter position both the pintle e^3 and the segmental nut d are in contact

with the peripheral surface of the thickest part of the ring c , thus holding and locking the recording or reproducing instrument in its elevated position (out of contact with the record-cylinder) and the segmental nut out of engagement with screw a' , leaving the carriage free to be moved along the tube a by grasping the handle c^4 .

Upon lifting the handle to the position shown in Fig. 3, after having moved the carriage to the desired position, the pintle g is allowed to ride down the cam-surface c' and the nut d down the cam-surface c^2 , permitting the recorder or reproducer to descend gradually to contact with the tablet and the nut to be elevated to engagement with the feed-screw.

A shaving knife or cutter i for cutting down the tablet to remove an old record and present a new surface to the recorder is mounted on the end of a stem i' , enlarged in diameter at its outer end, forming a shoulder i^2 . About this stem and fixed in a chamber extending transversely through the part B' of the carriage is a sleeve i^3 , split along its under side and for about half-way along its upper side and having an interior shoulder i^4 . This sleeve has an interior diameter approximating that of the larger part of stem i' , which it slightly overlaps. A spring k surrounds the smaller part of stem i , being confined between the shoulders i^2 and i^4 and exerting its tension to force the stem to the right, as shown in Fig. 4, and hold the cutter away from contact with the tablet. To prevent rotation of the stem and consequent alteration in the position of the cutter, splines or lugs i^5 i^6 thereon engage, respectively, in the slots formed by the splits in the sleeve i^3 , lug i^5 also making contact with a screw k' to limit the movement of the stem under the tension of the spring. A cap or deflector k^2 , through which the cutter projects, is secured on the inner end of stem i' .

When it is desired to bring the cutter to an operative position, the stem i' is pushed forward to contact with the tablet against the tension of the spring, in which position it is gripped and held through the action of a screw l , abutting against one side of sleeve i^3 and adapted to be manipulated by a lever l' , carrying a stop-arm l^2 , which makes contact with sleeve b to compress the sleeve against the enlarged portion of the stem i' . During the operation of the shaving-knife it is preferable to remove the recorder or reproducer from the joint e' before raising the handle c^4 to throw the carriage into gear, or a more rapid movement can be effected by hand.

I will next describe that part of my invention relating to the end-gate arrangement for one of the mandrel-bearings. As hereinbefore stated, one of the bearings has been carried by a swinging arm adapted to swing rearwardly in a horizontal plane and having a rocking lever swinging in a vertical plane, two movements being required to close and

secure the arm. According to the present invention a vertically-swinging gate M, carrying one bearing of the mandrel O, is hinged on a pivot-pin m to one end of the frame A and is adapted to be dropped to the position shown in dotted lines in Fig. 2. The end gate carries a vertically-moving spring-actuated pivoted latch m' , having an upwardly-extending lever m^2 and lying in a suitable recess in said gate. The latch projects beyond the side of the gate, said projecting end having a rounded under edge which rides up an incline m^3 on the framework and dops into a notch m^4 therein, automatically locking the gate when it is elevated to the position shown in full lines in Fig. 2. To insure a close engagement of the latch in the notch m^4 , the latter is slightly flared, (one wall being inclined,) thereby preventing even the slightest movement and rattling of the gate, or an equivalent construction would be to employ a wedge-shaped latch with either a flaring or straight notch.

The driving mechanism and starting devices are illustrated in particular in Figs. 1, 2, and 3, wherein o is the mandrel-shaft, and p the pulley for driving the same. Referring to Figs. 1 and 3, pulley p is loose. r is a pulley fixed on shaft o and having peripheral pins. r' is a similar but larger pulley on screw-shaft a' and connected with pulley r by a perforated strap r^2 . To throw the shaft o in gear, a clutch s , having a double set of teeth and splined on said shaft, is adapted to be engaged with teeth on the side of the driving-pulley p . This clutch is manipulated from a key s' through suitable levers and connecting-rods. Upon throwing the clutch out of gear the momentum acquired will ordinarily prolong the rotation of the mandrel and tablet. To avoid this and stop the shaft immediately, a fixed lug or projection s^2 is arranged on the frame A in such position that when one set of the teeth of clutch s is thrown out of gear with wheel p one of the teeth of the other set will engage said lug. This is advantageous either in recording or reproducing when pauses are made.

In Fig. 2 I have shown a stop mechanism which operates automatically upon dropping the gate M. As here shown, the pulley p is fast on shaft o , which also carries a pinion t , from which motion is communicated through gears to the screw-shaft. At this end the shaft has two bearings t' t^2 on each side, respectively, of the pinion t and necessarily arranged close together. In the normal position of the parts the shaft o runs in the bearing t , in which it has a slight play, not touching auxiliary or intermediate bearing t^2 , whose internal diameter is somewhat greater than that of the shaft. When, however, the gate is dropped, allowing the mandrel to descend to the position shown in dotted lines, Fig. 2, the shaft o makes contact with bearing t^2 . The friction generated by the contact

and inclination of the shaft in the two bearings is sufficient to automatically stop rotation when the machine is actuated by a spring-motor, or rotation due to the momentum of the parts.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a graphophone the combination with the carriage and its actuating-screw, of a guide-tube inclosing said screw and upon which the carriage slides, an arm or support on the carriage for the recorder or reproducer a ring on the carriage arranged concentric to the tube, and a handle for manipulating said ring to both lift the reproducer or recorder from the record-cylinder and disengage the carriage from the feed-screw and for lowering the recorder or reproducer to the record and engaging the carriage with the feed-screw, by a reverse movement, substantially as described.

2. In a graphophone the combination with the feed-screw and its inclosing tube, of a carriage sliding on the latter, a nut for throwing the carriage into gear with the feed-screw, a ring having peripheral cam-surfaces thereon, one for disengaging the nut from the feed-screw and the other for lifting the recorder or reproducer off the record-cylinder, and arranged concentrically to the inclosing tube, and a handle or device for actuating said ring, substantially as described.

3. In a graphophone the combination with the carriage and a recorder or reproducer carried thereby, of a device—such as a cam—mounted on the carriage for lifting the recorder or reproducer and simultaneously locking it in its raised position, and a handle for actuating said cam and for manually moving the carriage, substantially as described.

4. The combination with the carriage, of a shaving knife or cutter carried by a spring-actuated stem adjustable in said carriage, and normally held out of contact with the record-cylinder, a split sleeve around said stem, a device—such as a screw—for compressing the sleeve to clamp and hold the stem in an adjusted position, and a lever for actuating said device, substantially as described.

5. In a graphophone, the combination with the carriage, of a shaving knife or cutter carried by a spring-actuated stem adjustable in said carriage, and normally held out of contact with the record-cylinder, a split tube around said stem forming a chamber about the same, in which chamber the actuating-spring is inclosed, and means for compressing said sleeve to clamp the stem in an adjusted position against the tension of said spring, substantially as described.

6. In a graphophone, the combination with the carriage, of a shaving knife or cutter carried by a stem adjustable in said carriage, a split sleeve around said stem, means for compressing said sleeve to clamp the stem in an adjusted position, and a spline on the stem

engaging in the slot or groove formed by the split in the sleeve, substantially as described.

7. In a graphophone, the combination with the mandrel, of a gate carrying one bearing thereof and adapted to drop on a horizontal axis when opened, and means for locking said gate in a closed position, substantially as described.

8. The combination with the mandrel, of a gate carrying one bearing thereof and adapted to drop on a horizontal axis when opened, and an automatically-operating latch on said gate for locking it in its closed position, substantially as described.

9. The combination with the mandrel, of a gate carrying one bearing thereof, a spring-actuated latch for automatically locking said gate in its closed position and adapted to engage in a flaring notch in the frame of the machine, substantially as described.

10. In a graphophone the combination with a mandrel and its shaft, of bearings one stationary and the other movable, upon which

said shaft normally rests, a gate carrying said movable bearing, and an auxiliary bearing in proximity to the stationary bearing and with which said shaft makes engagement to arrest and prevent rotation of the mandrel when said gate is open, substantially as described.

11. In a graphophone the combination with a tubular pivoted joint to which the recorder or reproducer is adapted to be connected, and through which the sound is communicated of a spring connected therewith, of a tension not sufficient to overcome but acting to diminish the force of gravity by which said instrument is held in contact with the record-cylinder, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

CLEMENT MARCH,
G. L. HUBBELL.

(No Model.)

2 Sheets—Sheet 1.

F. L. CAPPS.

SPRING MOTOR FOR PHONOGRAPHS, &c.

No. 570,378.

Patented Oct. 27, 1896.

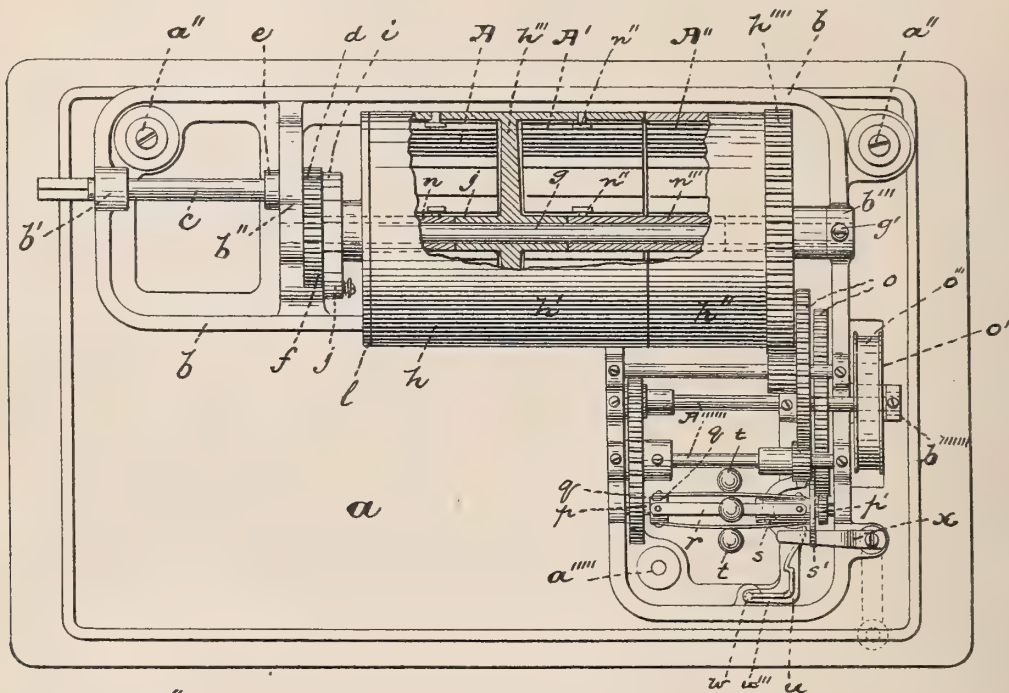


Fig. 1.

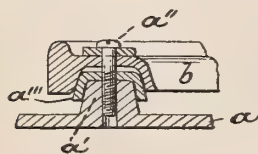


Fig. 1.^a

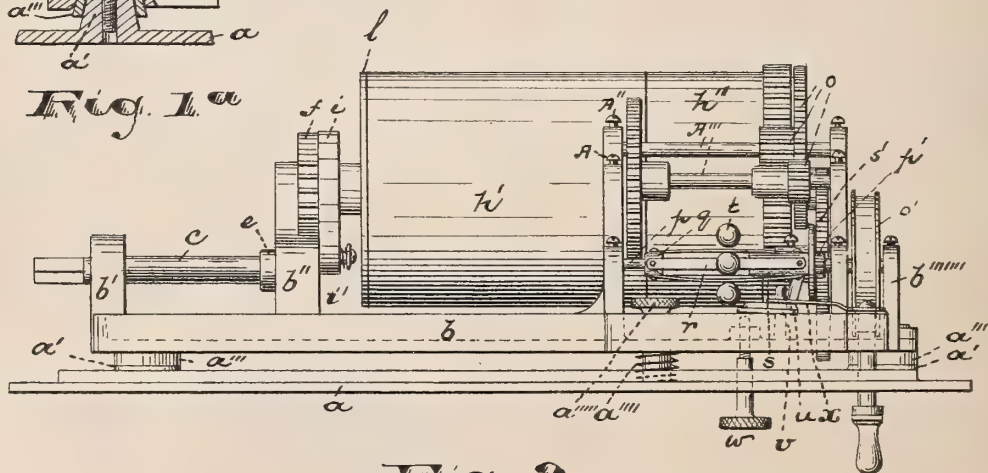


Fig. 2.

WITNESSES:

Robert Gallberger
L. B. Fittney

INVENTOR:

Frank L. Capps.,

BY Drake & Co. ATTY'S.

F. L. CAPPS.
SPRING MOTOR FOR PHONOGRAPHS, &c.

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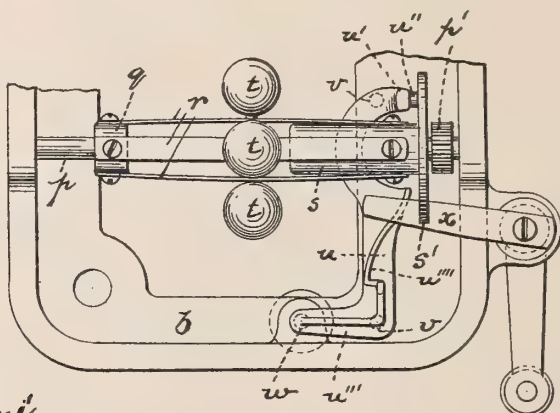


Fig. 3.



Fig. 7.

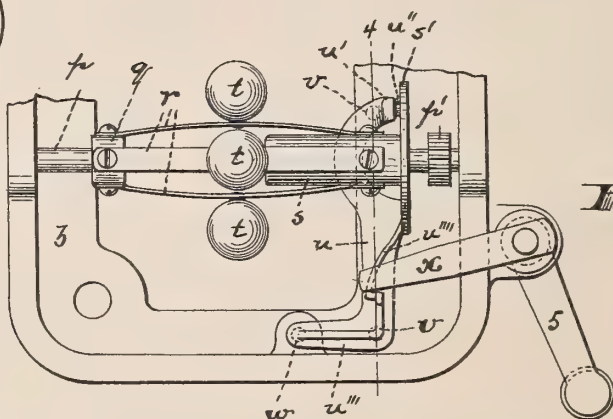


Fig. 4.

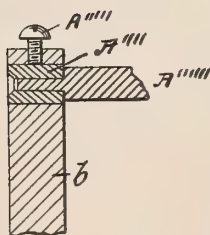


Fig. 8.

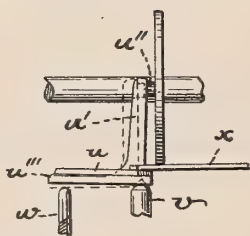


Fig. 5.

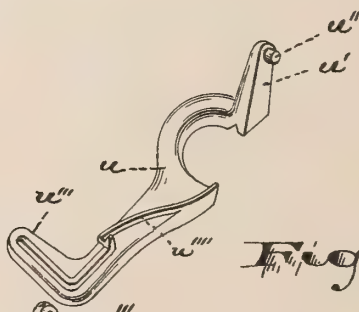


Fig. 6.

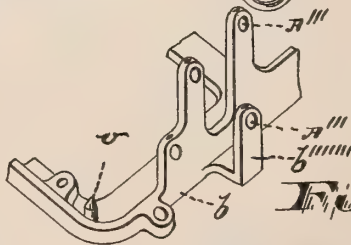


Fig. 9.

WITNESSES:

Robert Solberger
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INVENTOR:

Frank L. Capps.

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UNITED STATES PATENT OFFICE

FRANK L. CAPPS, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE UNITED STATES PHONOGRAPH COMPANY, OF SAME PLACE.

SPRING-MOTOR FOR PHONOGRAPHS, &c.

SPECIFICATION forming part of Letters Patent No. 570,378, dated October 27, 1896.

Application filed December 20, 1895. Serial No. 572,744. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. CAPPS, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Spring-Motors for Phonographs, &c.; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and numerals of reference marked thereon, which form a part of this specification.

The object of this invention is to reduce the cost of construction, to provide a motor for phonographs which will be more convenient for the operator and more effective in producing an even and regular movement, and to secure other advantages and results, some of which will be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved motor for phonographs, &c., and in the arrangements and combinations of parts, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters and numerals indicate corresponding parts in each of the several views, Figure 1 is an inverted plan of the improved motor, partly broken away to show the interior construction of a certain spring-containing barrel. Fig. 1^a is a detail section showing the construction of certain bearings for a supplemental plate. Fig. 2 is an inverted front elevation of the motor. Figs. 3 and 4 are detail views illustrating the construction and operation of a governing mechanism. Fig. 5 is a detail elevation of a frictional lever and its cooperating disk; and Fig. 6 is a perspective view, on an enlarged scale, of the lever. Fig. 7 is a detail plan of a certain ratchet-wheel and escapement-pawl. Fig. 8 is a section illustrating the bearings for the arbors of the governor gear-wheels, and Fig. 9 is a detail perspective of the bed-plate.

In said drawings, *a* indicates a bed-plate adapted to receive on its upper side the phonograph in any suitable and convenient man-

ner. It may be the phonograph-body. On the under side of the said plate the same is provided with rear bearings *a'*, upon which a supplemental adjustable frame or plate *b* is secured, said plate *b* being correspondingly socketed, as shown in Fig. 1^a, and rubber blocks or washers *a'''* being interposed between said bearings and the said supplemental frame or plate, admitting of a limited play or hinge action of the said supplemental plate and preventing the transmission of sound from the motor to the phonograph. At its forward side a spiral spring *a''''* is interposed between the bed-plate and the said supplemental frame or plate, said spring serving to hold said plates normally apart with an elastic pressure, but easily giving to the adjusting-screw *a'''''* when adjusting the motor to the phonograph and tightening or loosening the driving-belt *o'''*, which transmits power and motion from the said motor to said phonograph. The said frame or plate *b* is in plan of an L shape in general outline and is loosely held on its cushioned rear bearings by screws *a''* and at the front by the adjusting-screw above referred to. It is preferably of a single casting. On the under side it is provided with integral downwardly-projecting hangers, as indicated clearly in Fig. 9, for the train of governor-gearing and co-operating motive devices. To secure a more smooth and even movement, attain greater durability, and to enable the arbors of the gear-wheels to be more readily placed in position, I form in said hangers holes *A'''* *A'''*, larger in diameter than the arbor, and into said holes are fitted bushings *A''''*, Fig. 8, of hardened steel. These are held in place after adjusting the arbors therein by set-screw *A'''''*.

Upon the longer arm of the L-shaped frame or plate *b*, at the rear of the same, are formed hangers *b'* *b''*, and in the same is pivoted a winding-arbor *c*. This latter is held in place, so as to prevent longitudinal movement, by a pinion *d* at one side of the hangers *b''* and a collar *e* at the other. The outer extremity of the said winding-arbor is angular, made to receive a winding-crank in any ordinary manner.

The cog-wheel or pinion *d* of the winding shaft or arbor meshes with a cog-wheel *f*, car-

ried by a shaft g , extending from the hanger b'' to another hanger b''' of the supplemental plate b at the opposite end of the spring-barrel h . The said shaft g is fixed in its bearings by a set-screw g' , or in any suitable manner, and upon the said shaft the spring attachments, including the cog-wheel f and parts hereinafter to be referred to, revolve loosely.

To the cog-wheel f is rigidly connected a ratchet-wheel i , adapted, in coöperation with an escapement-pawl i on the plate b , to prevent back movement of said cog-wheel and to maintain the spring in its wound condition. By employing an escapement-pawl rather than a spring-pawl I avoid the noise due to the spring bearing positively on the ratchet o . The barrel h is preferably in sections, and three springs are employed, as in the construction shown.

The section h' contains interiorly a diaphragm or web h''' , having at the axial center of the barrel a hub j , through which the shaft g extends, the hub holding the barrel-section h' so that it will have regular and even movement on said shaft g . At the side of the ratchet-wheel i , between it and the end of the barrel, a barrel end piece or head l may be employed to prevent the entrance of dust to the spring-chamber and to prevent the spring A from working laterally outward and interfering with the bearings of the ratchet-wheel. On opposite sides of the said web of the section h' are arranged springs A A' , one of which springs is fastened to the sleeve or hub-like extension n of the ratchet-wheel i . The second spring A' , on the opposite side of the web from that first referred to, is also fastened to a sleeve at its inner end, which sleeve is also loosely arranged on the shaft g and extends laterally from the barrel-sections h' into the second barrel-section h'' , where it receives a third spring A'' . The sleeves and barrel-sections are provided with buttons, such as n'' , on which the perforated ends of the springs are removably secured.

The first two springs A A' are each attached at their outer ends to the barrel-section h' . The third spring A'' is in like manner attached to the section h'' at its outer end. The springs in the section h' are wound oppositely, so that the power of one spring will communicate its power to the other. The inner ends of the springs A A'' are secured to the loose sleeve n''' .

At the periphery of the barrel-section h'' the same is provided with a cogged surface h'''' , by which movement is transmitted from said barrel-section to a train of gearing o , having bearings in the hangers of the shorter branch of the L-shaped supplemental frame, as above referred to, and by which power is transmitted to a driving-wheel o' , the said driving-wheel being preferably adapted to receive a belt o'' to convey power to the phonograph. The said driving-wheel is arranged on an outside bracket or extension b'''''' of

the frame, as indicated in Fig. 9, so that the belt can be conveniently detached from or applied to the motor without disarranging the adjustment of the working parts. In train with the said gearing o is arranged a governor of peculiar construction for regulating and controlling the movements of said parts. The said governor consists, preferably, of the parts shown in detail in Figs. 3, 4, 5, and 6, where p indicates the shaft receiving power by means of the cog-wheel p' from the train of gearing o and spring motive devices. q is a collar fixed to said shaft p , and r r are springs fastened upon said collar and extending substantially parallel with said shaft p to a loose collar s , movable longitudinally on said shaft p . The said springs r are provided at their centers with weights t , which tend to bow the springs outward as centrifugal force is exerted, the bowing increasing or diminishing in accordance with the increasing or diminishing speed of rotary movement. The bowing of the springs produces a corresponding longitudinal movement of the sliding sleeve or collar s , as will be evident. Upon said sleeve or collar s is formed or secured a frictional disk s' , adapted to engage an arm of a frictional rocking or canting lever u , seated on bearings of the supplemental bed-plate and having an irregular shape. The said lever u is preferably fulcrumed upon two pointed lugs v v , Figs. 3, 4, and 5, formed upon and extending up a short distance from the supplemental plate, so that when said lever is turned to one side or the other of said fulcrumal lugs it will be stopped and held at an inclination by the adjusting-screw w in said supplemental plate. Said lever is provided with an arm u' to engage the frictional disk or flange s' , the said arm being provided with a cushion-like bearing u'' , preferably of leather, to provide a proper and effective frictional contact. The said supplemental plate, as above intimated, is provided with an adjusting-screw w , and the lever u with an arm u''' to engage the same and control the movements of the frictional lever, limiting its movements and thereby regulating and controlling the speed of the motor. The said lever is held in its fulcrumal bearing v v by a spring-arm x , which bears on a curved ridge u'''' , said ridge at its line of greatest projection crossing the axis or fulcrumal line indicated by the line, Fig. 4, on which the latter vibrates. The spring x operates in connection with a hand-lever 5, by turning which latter the spring is caused to move over said ridge or rib of the lever from one end to the other, so that it will bear upon the opposite side of the fulcrumal line from what it did before turning, and thus cause the arm u' to oscillate from or toward the disk s' , as will be understood.

When the spring x bears on the lever at the side of the axial line 4 toward the disk s' , as shown in Fig. 3, the said lever at its point of frictional bearing u'' engages the side of

the disk and causes such a hard pressure upon it as to cause the motor mechanism to stop operations. When turned to the second position, as shown in Fig. 4, the bearing *u''* will be entirely disconnected from the said disk, and thus the motor devices will be free to operate until a normal speed is reached. A greater speed will cause the weights to be thrown out to such a degree and the springs *r* to be so flexed as that the disk *s'* will be drawn into frictional contact with the said arm *u'*, and the speed of said disk and the parts to which it is attached will be brought back to the normal speed desired. By adjusting the lever by means of the screw *w* the normal speed may be increased or diminished at will.

The construction thus described provides a convenient and easily-operable means of controlling the motor, is of small cost, and is consequently a desirable and advantageous device.

The operation of the invention, it is thought, has been sufficiently described, and a further description is deemed to be of no advantage to a full and clear understanding of the invention by one skilled in the art and would only tend to prolixity.

Having thus described the invention, what I claim as new is—

1. A speed-governor for motors, comprising a shaft which is driven by the motor, a disk or flange rotating with said shaft, centrifugal devices for moving said disk or flange laterally, a brake device with which said disk or flange engages, means for adjusting the position of the brake device whereby the disk or flange may be moved into frictional engagement therewith at varying rates of speed produced by the centrifugal devices, and independent means for moving said brake device into engagement with said disk or flange with sufficient friction to prevent rotation thereof, substantially as set forth.

2. A speed-governor for motors, comprising a shaft which is driven by the motor, a sleeve rotating with but movable laterally on said shaft, a disk or flange carried by said sleeve, centrifugal devices for moving said sleeve laterally, a brake device with which said disk or flange engages, means for adjusting the position of the brake device, whereby the disk or flange may be moved into frictional engagement therewith at varying speeds produced by the centrifugal devices, and independent means for moving said brake device into contact with said disk or flange with sufficient friction to prevent rotation thereof, substantially as set forth.

3. In a motor for operating phonographs, the combination of a bed-plate adapted to receive the phonograph, a frame beneath said plate and supported therefrom, a motor and speed-governing device carried on said frame, an adjusting-screw for regulating said speed-governing device, said screw passing through

an opening in said plate, a belt-wheel for said motor to which power is applied, said belt-wheel being adapted to receive the belt to the phonograph, and means for adjusting said frame in its relation to said bed-plate, whereby said belt may be tightened or loosened, substantially as set forth.

4. In a motor for operating phonographs, the combination of the bed-plate to receive the phonograph, a frame beneath said bed-plate and supported therefrom, a motor and speed-governing device carried on said frame, an adjusting-screw for regulating the speed-governing device, a controlling-arm for stopping and starting the motor, said screw and said arm passing through openings in said plate, a belt-wheel for said motor to which power is applied, said belt-wheel being adapted to receive the belt to the phonograph, and means for adjusting said frame in its relation to said bed-plate, whereby said belt may be tightened or loosened, substantially as set forth.

5. In a motor, the combination with the sliding flange or disk and centrifugal means for operating the same, of a bed-plate, a lever pivotally mounted on said bed-plate and adapted to cant to one side or the other of its pivot-point, and having a frictional arm to engage the said disk or flange, and means for holding said lever in either of its canting positions to throw the arm to or from frictional relation to the disk or flange, substantially as set forth.

6. In a motor, the combination with the sliding flange or disk and centrifugal means for operating the same, of a bed-plate, a lever pivotally mounted on said bed-plate, and having a frictional arm to engage the said disk or flange, and a spring engaging said lever and adapted to cant the same to one side or the other of its pivot-point, substantially as set forth.

7. In a motor, the combination with the sliding flange or disk and centrifugal means for operating the same, of a bed-plate, a lever pivotally mounted on said bed-plate, and having an arm to engage said flange or disk, and an adjustable spring adapted to force said lever so that it will change its direction of inclination and cant to one side or the other of its pivot-point, and a finger-piece for operating said spring, substantially as set forth.

8. The improved spring-motor, comprising a bed-plate, springs and means for transmitting movement from said springs, and a governor comprising a shaft receiving power from said springs, a disk or flange sliding on said shaft, centrifugal devices governing the sliding movement of said disk or flange, a lever having an arm movable from or toward the side of the said flange or disk, an adjusting-screw, and a hand-operable spring adapted to be adjusted in its relation to said lever to bear on said lever at one side of the ful-

crum thereof, or the other, all of said parts being arranged and adapted to operate, substantially as and for the purposes set forth.

9. The improved spring-motor, comprising
5 a bed-plate, springs, means for transmitting motion from said springs, and a governor comprising a shaft, springs rotating therewith, weights on said springs, a sliding flange or disk, an adjustable lever having a friction-
10 arm, and a spring pivoted upon the bed-plate and adjustably arranged with relation to said lever, whereby said spring may press upon said lever upon either side of the fulcrum, all of said parts being arranged and
15 combined, substantially as and for the purposes set forth.

10. In a spring-motor, the governor having a laterally-movable disk or flange, and a pivoted friction-lever having a ridge or bearing
20 across the axial line, and a spring adapted to slide on said ridge or bearing to throw said lever to or from frictional relation to said disk or flange, substantially as set forth.

11. In a spring-motor, the governor having
25 a laterally-moving disk or flange, operable under centrifugal force, a friction-lever having a ridge or bearing across the axial or fulcrumal line of said lever, a pivoted spring, and a finger-piece for operating said spring,
30 substantially as set forth.

12. In a spring-motor, the governor having a laterally-moving disk or flange, a lever pivotally mounted adjacent to said disk or flange, a friction-arm carried by said lever near one
35 end for engaging said disk or flange, an arm secured to said lever near its other end, and an adjusting-screw coöperating with the last-mentioned arm for regulating the lever and moving the friction-arm toward and away
40 from said disk or flange, substantially as set forth.

13. In a spring-motor, the governor having a laterally-moving disk or flange, a friction-lever having a rib u''' and arms u' , u'''' , an
45 adjusting-screw w , and an arm x , and a finger-piece 5 for turning said arm x in its relation to said lever, substantially as set forth.

14. In a spring-motor, the governing-lever having a frictional arm, an arm to receive an
50 adjusting-screw, a ridge across the fulcrumal line of said lever, in combination with said adjusting-screw, a spring-arm adapted to be adjusted in its relation to said ridge, and governing devices adapted to receive said frictional
55 arm, substantially as set forth.

15. In a spring-motor, the combination with the centrifugal device, of a bed-plate having two bearings, a lever fulcrumed thereon and having a ridge or bearing crossing the fulcrumal line of the bearings for the lever, an
60 arm at one end of said lever engaging or adapted to engage said centrifugal device, and control its rotary movement, an arm at the other end of said lever, an adjusting-screw coöperating with the last-mentioned
65 arm, a spring-arm coöperating with said ridge or bearing, and a finger-piece for operating

the same, substantially as and for the purposes set forth.

16. In a motor, the combination with the
70 sliding flange or disk and centrifugal means for operating the same, of a bed-plate having fulcrumal projections, a lever seated on said projections and adapted to cant to one side or the other of the same and having a frictional
75 arm to engage the said disk or flange, and means for holding said lever in either of its canting positions and throw the arm to or from frictional relation to the disk or flange, substantially as set forth.

17. In a motor, the combination with the
80 sliding flange or disk, and centrifugal means for operating the same, of a bed-plate having a fulcrum, a lever seated on said fulcrum and having a frictional arm to engage the said
85 disk or flange, and a spring holding said lever on said fulcrum and adapted to cant said lever to one side or the other of the same, substantially as set forth.

18. In a motor, the combination with the
90 sliding flange or disk and centrifugal means for operating the same, of a bed-plate having a fulcrum, a lever seated on said fulcrum, and having an arm to engage said flange or disk, and an adjustable spring
95 adapted to force said lever so that it will change its direction of inclination and cant to one side or the other of said fulcrum, and a finger-piece for operating said spring, substantially as set forth.

19. The improved phonograph-motor herein described, comprising a bed-plate adapted to receive the phonograph, an integral frame
100 hinged upon said bed-plate and having a limited movement thereon, said frame having hangers, motive devices arranged on said hangers and having a belt-wheel which is adapted to receive the belt to the phonograph, a governor for controlling or regulating the
105 movements of the motor and phonograph, and means for adjusting said frame in its relation to the bed-plate, whereby said belt may be tightened or loosened at will, said parts being combined, substantially as set forth.

20. The improved phonograph-motor comprising a bed-plate adapted to receive the
110 phonograph, an adjustable frame hinged upon said bed-plate and having a limited movement thereon, motive devices supported on said frame and having a belt-wheel adapted to receive the belt which communicates power to the phonograph, a governor also carried
115 by said frame, an adjusting screw or device, and elastic springs or cushions disposed between the frame and bed-plate, said parts being combined, substantially as set forth.

21. The combination with a phonograph bed-plate, of a supplemental plate having a hinge-like movement, cushions being interposed between said plates, motive devices
120 and a governor, and means for adjusting said plates and thus tightening or loosening the belt conveying power from the motor to the phonograph, substantially as set forth.

22. The improved phonograph-motor herein described, comprising a bed-plate, an integral L-shaped frame adjustable in its relation to said plate, interposed cushions and
5 means for adjusting said frame, a spring-barrel arranged on the longer arm of the L-shaped frame, springs and means for winding the same, governing devices arranged on the shorter arm of the frame, gearing for
10 transmitting power from the springs to the governor and phonograph, the said L-shaped frame and the parts supported thereby being all disposed between the plane of the bed-plate, and said parts being all combined, sub-
15 stantially as set forth.

23. The combination of a bed-plate having

projecting bearings at the rear, an adjustable frame having corresponding sockets, and interposed elastic cushions, screws holding the parts together and admitting a limited
20 hinge action, means for adjusting said frame in its relation to the bed-plate, motive and governing devices carried by said frame, and means for transmitting power adjustable with
25 said frame, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 29th day of November, 1895.

FRANK L. CAPPS.

Witnesses:

CHARLES H. PELL,
C. B. PITNEY.

(No Model.)

E. H. AMET.
TALKING MACHINE APPARATUS.

No. 573,071.

Patented Dec. 15, 1896.

FIG. I.

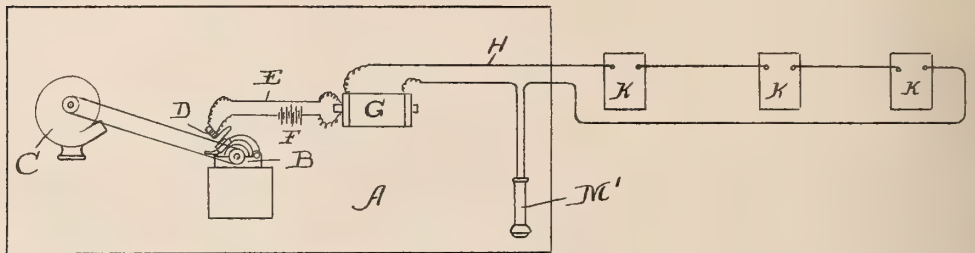


FIG. 2.

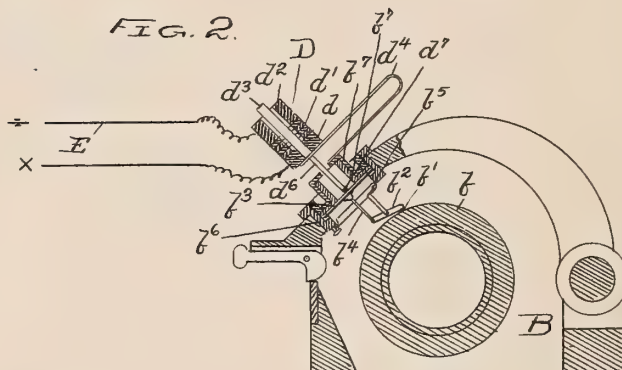


FIG. 3.

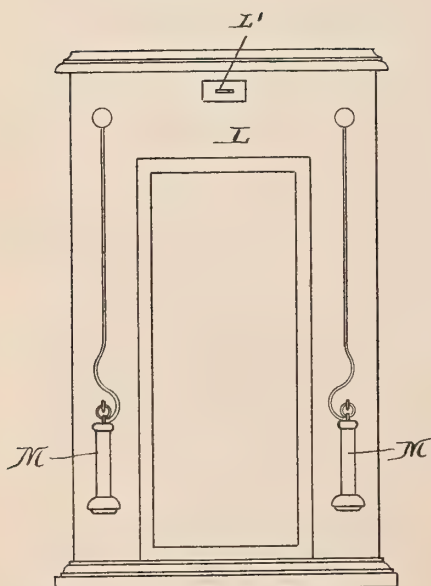
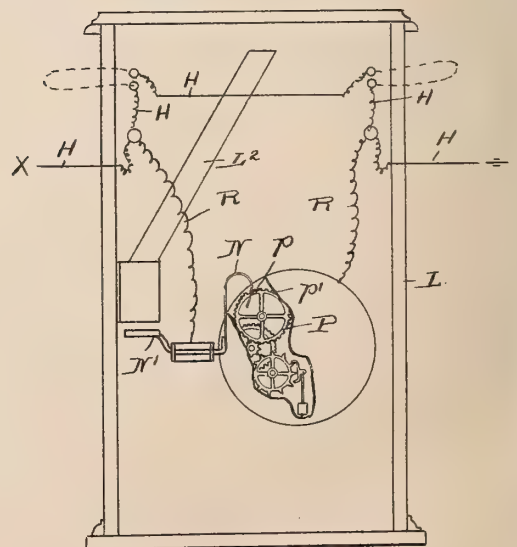


FIG. 4.



WITNESSES:
Sew. C. Curtis
A. W. Munday.

INVENTOR:
EDWARD H. AMET
BY Munday, Swartz & Adcock.
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF WAUKEGAN, ILLINOIS.

TALKING-MACHINE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 573,071, dated December 15, 1896.

Application filed September 21, 1894. Renewed June 13, 1896. Serial No. 595,497. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing in Waukegan, in the county of Lake and State of Illinois, have invented a new and useful Improvement in Talking-Machine Apparatus, of which the following is a specification.

My invention relates to improvements in talking-machine apparatus.

Heretofore in the ordinary slot-machine or coin-controlled talking-machine apparatus it has been customary to employ at each station a complete graphophone and motor for running it in connection with a coin-controlling mechanism. The first cost of this complete machine for each station is therefore considerable, and it is a matter of continual expense to keep it in repair, as the machine is frequently manipulated by careless and inexperienced persons.

The object of my improvement is to provide a talking-machine apparatus wherein a large number of stations may be supplied or operated by a single talking-machine or graphophone at a central station, thus saving the expense of the large number of graphophones necessarily employed heretofore, (one for each station,) and whereby, also, at the same time the words, songs, or music reproduced at the several stations may be freed from the disagreeable harsh and scratchy noise due to the movement of the graphophone-needle over the wax cylinder, while at the same time the use of the apparatus at each and every station may be controlled by coin or token through a slot-machine mechanism located at each station.

To this end my invention consists, in connection with a graphophone or other talking-machine located at a central station, of a variable-resistance pile supported upon and connected with the needle of the talking-machine, this variable-resistance pile being included in the primary circuit of an induction-coil the secondary circuit of which leads to the several stations, each of which stations has a telephone adapted to be included in this secondary or telephone circuit by a circuit-breaker operated by the coin or token and controlled by a time-train or clock mechanism located at each station, so that through

the action of the variable-resistance pile all the vibrations of the talking-machine needle will be reproduced in each and all of the telephones that may be in circuit.

My improvement also consists in the novel features and combinations herein shown and described, and particularly specified in the claims.

In the accompanying drawings, which form a part of this specification, I have shown at Figure 1 a diagram of a system or apparatus embodying my invention. Fig. 2 is a vertical transverse section taken through the needle of the talking-machine. Fig. 3 is a front view of the box or case located at each station furnished with the slot for receiving the coin or token and containing the circuit-breaker and time-train or clock mechanism for regulating the time the telephone remains connected with the circuit. Fig. 4 is a view similar to Fig. 3, with the front of the case broken away to disclose the clock mechanism and circuit-breaker.

In the drawings the same part is indicated by the same reference-letter in all the different figures.

In the drawings, A represents the central station, at which is located the talking-machine B, the motor C for running it, the variable-resistance pile D, the primary circuit E, battery F, and the induction-coil G.

The talking-machine B may be of any known or suitable construction, and its parts need no detailed description, *b* being the wax cylinder; *b'*, the needle; *b''*, the lever carrying the needle; *b'''*, the diaphragm; *b''''*, the connection between the diaphragm and needle-lever; *b'''''*, the pivoted lever supporting the needle-lever; *b''''''*, the ring or pin to which the diaphragm is secured, and *b'''''''* the thimble upon which the ear-tube is ordinarily secured.

The variable-resistance pile D consists, preferably, of a terminal carbon disk *d*, a series of loose carbon disks *d'*, and the other terminal carbon disk, *d''*. The lower carbon disk *d* has fixed to it a core or pin of wood fiber or other insulating material *d'''*, upon which the loose carbon disks *d'* and *d''* are supported. The variable-resistance pile D is supported upon a light spring *d''''*, preferably of a U shape, one limb of which is fixed to the thimble *b'''''''* and the other

limb of which is fixed to the terminal disk d , and the carbon pile is connected with the diaphragm b^3 of the talking-machine by a pin d^6 , which is preferably furnished with a rubber cushion d^7 on the end bearing against the diaphragm. The loose terminal carbon disk d^2 is made thicker and heavier than the intermediate disk d' , so that its gravity will serve to maintain the requisite pressure or contact between the several carbon disks of the pile. By reason of the connection between the variable-resistance or variable-contact pile D and the needle of the talking-machine the vibrations of the needle produce corresponding pulsations in the electric current on the circuit E, (one terminal of which is connected to the fixed terminal d and the other to the loose terminal d^2), owing to the variation in contact and pressure between the several carbon disks of the pile produced by the vibrations of the needle communicated to the pile, and the pulsations or variations in the primary current E are of course reproduced in the induced current on the telephone-circuit H, leading to the several stations K, at which are located the boxes L, containing the telephones M, circuit-breaker N, and time-train or clock mechanism P.

The box or case L may be of any ordinary form or construction, and is furnished with a slot or opening L' for receiving the coin or token and a chute or conductor L^2 for conveying the coin or token to the pivotal arm or lever N' , which moves or operates the circuit-breaker spring or contact-piece N. The other contact-piece, which engages the contact-piece N, consists of a pin or projection p on one of the wheels p' of the time-train or clock mechanism P, so that the secondary or telephone circuit H, which remains normally closed through the contact-pieces N and p and the clock mechanism, may be broken during the interval that the wheel p' makes one revolution, so that during this interval the telephone M will thus be included in the circuit and ready for use, as clearly illustrated in Fig. 4. The time required for one revolution of the wheel p' of the clock-train is sufficient to complete the song, piece of music, or other composition on the wax cylinder of the talking-machine B.

The spring-contact or circuit-breaker N is preferably made of the form indicated in the drawings, and the strength of the spring should be comparatively slight, so that when the contact-pin p strikes against the spring and the clock-train is thus stopped the spring will be slightly compressed and thus cause the spring to come on the opposite side of the pin p , when the spring is again momentarily swung out of the path of the pin p and returned to position. But for this compression of the spring-contact N there would be danger of its again striking on the wrong side of the pin p , as the clock-train naturally starts somewhat slowly, and the wheel p' , having a very slow movement, and as the coin dropping

against the lever N' only momentarily moves the circuit-breaker N out of the path of the pin p on the wheel p' .

I preferably provide two telephones M M at each station, so that the user may hold one to each ear, as this adds somewhat to the ease of hearing and serves in some measure to exclude outside noises or sounds.

The operation is as follows: By the motor C the talking-machine B is kept continuously running at the central station, so that whenever a coin or token may be dropped into the slot L' of the box L at any one or more of the working or sub stations K the short circuit R, through the clock mechanism P and contacts N p , will be broken by action of the coin against the circuit-breaker lever N' for the time or interval required for the wheel p' to make one complete revolution, thus putting the telephones M M in the circuit H ready for use. When the wheel p' completes its revolution, the short circuit R, through the clock mechanism, will be again automatically closed by the pin striking against the contact N, thus cutting out the telephones. As the circuit H is a closed circuit at each and all the stations K, either through the clock mechanism or through the telephone, one or more or all the telephones may be used at one and the same time, thus reproducing at one or more or all the substations the composition on the cylinder of the talking-machine. Ordinarily I arrange the clock mechanism so that the time required for one complete revolution of the wheel p' is sufficient to repeat twice the song or other composition on the cylinder of the talking-machine, so that any user may hear the same from its beginning to its end once at whatever point the operation may happen to begin, owing to the fact that the cylinder of the talking-machine is revolving continuously. At the central station A, I preferably also include in the secondary or telephone circuit H a telephone M', so that the operator at the central station may at all times be able to tell whether the talking-machine is operating properly.

By combining the variable-resistance or variable-contact pile D directly with the needle of the talking-machine the sound vibrations or pulsations are produced with great distinctness and clearness on the telephone-circuit and in the telephones.

I have illustrated in the drawings what I believe to be the simplest and best means for connecting the carbon pile D with the needle of the talking-machine; but my invention is not limited to the particular mechanism employed for this purpose, as any suitable mechanism may be used which will serve to transmit the vibrations of the needle to the pile of carbon disks, as will be obvious to those skilled in the art.

I claim—

1. The combination with a talking-machine located at a central station, of a motor running the same continuously, a variable-re-

sistance pile connected with and operated by the needle of the talking-machine, a primary circuit in which said pile is included, a secondary or telephone circuit leading to a series of substations, each of which is furnished with a time-train, a coin or token controlled circuit-breaker and a telephone adapted to be included in the telephone-circuit

said telephone-circuit is broken through time-train by operation of the coin or token, substantially as specified.

2. The combination with a talking-machine located at a central station, of a variable resistance connected with and operated by the needle of the talking-machine, a primary circuit in which said variable resistance is included, a telephone-circuit, and a series of telephones therein located at a series of sub-

stations, and a series of slot-machine or coin-controlled mechanisms at said substations for putting said telephones in and out of circuit, substantially as specified.

3. The combination with a telephone-circuit, of a series of telephones located at a series of substations and adapted to be included in said circuit, a series of slot-machines or coin-controlled mechanisms at said substations for putting said telephones in and out of circuit, a talking-machine at a central station and means for transmitting its sound-vibrations to said telephone-circuit, substantially as specified.

EDWARD H. AMET.

Witnesses:

H. M. MUNDAY,
EDMUND ADCOCK.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 575,151.

Patented Jan. 12, 1897.

Fig. 1.

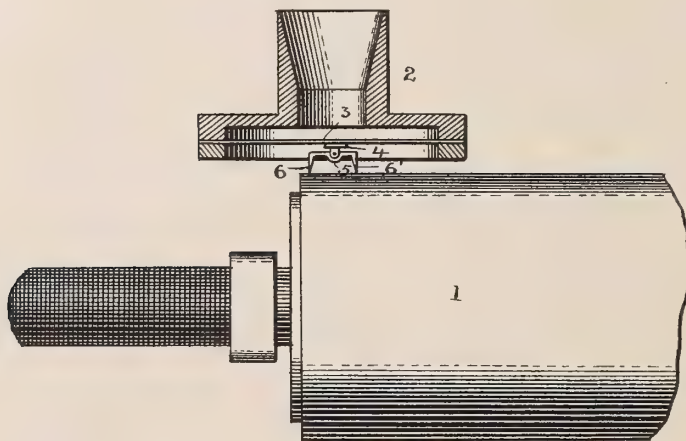
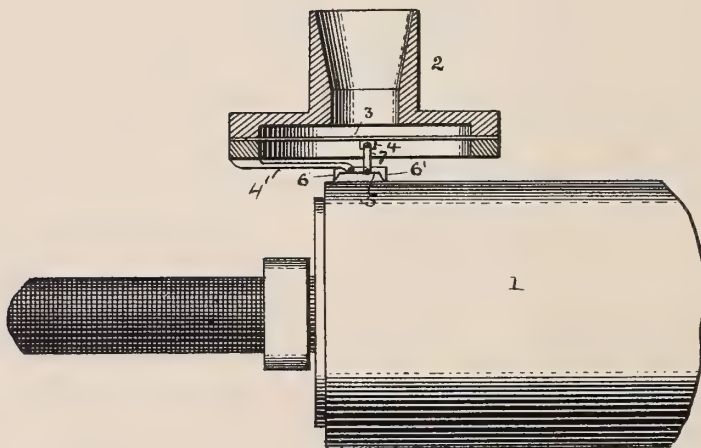


Fig. 2.



Witnesses
Norris A. Clark.
Wm. F. Clark.

Inventor
T. A. Edison.
By his Attorneys
Dyer & Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 575,151, dated January 12, 1897.

Application filed December 3, 1890. Serial No. 373,406. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 887,) of which the following is a specification.

My invention relates to improved recording and reproducing devices for phonographs; and the invention consists in a two-point recorder or reproducer adapted to make or travel in a double track on a phonogram-blank or recording-surface; and the invention also consists in certain combinations, as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a view of one form of recorder embodying the improvement, and Fig. 2 is a view of a modified form.

1 is the phonogram-blank, adapted to be turned in any suitable manner.

2 is the mouthpiece or speaking-tube, below which is diaphragm 3. To the diaphragm is connected a block or post 4, to which is pivoted the arm 5, carrying at each end a recording-point 6 6', both points bearing simultaneously on the surface of the blank, but preferably at a slightly-different distance from the pivot, the difference being substantially one-half of the pitch of the feeding-screw.

To use this phonograph, the recorder is set back so that point 6 is near the end of the phonogram-blank. The blank is then turned in the ordinary or any suitable manner, and at the same time the recorder is fed along toward the opposite end of the blank. When the diaphragm is set into vibration by speaking into the mouthpiece, both points 6 6' are vibrated and both make an independent record of the same sounds on the surface of the blank. A similar two-point instrument is used for reproducing, one point traveling in the record made by point 6 and the other traveling in the record made by point 6'. This apparatus gives a very true record, and

the reproduced vibrations give a very clear and well-defined reproduction of the original sounds.

In Fig. 2 the arm 5, having the recording-points 6 6', is pivoted to an arm 4', instead of being pivoted directly to the block mounted on the diaphragm. Said arm 5 is, however, connected to the diaphragm by means of the link or yielding connection 7. This recorder also makes two separate records, but it will be clear that one point will move up as the other moves down, and vice versa, instead of moving in the same direction as in the other apparatus.

Having thus described my invention, what I claim is—

1. In a phonograph, the combination with the diaphragm, of two recording or reproducing points arranged to act on the same side of the blank and having a common connection with the center of the diaphragm, such points being located at different distances from said center, substantially as set forth.

2. In a phonograph, the combination with the diaphragm, of two recording or reproducing points arranged to act on the same side of a blank, and carried by an arm pivoted upon a support independent of the diaphragm, said arm having a pivoted connection with the diaphragm whereby the movements of the diaphragm will move the points in opposite directions, substantially as set forth.

3. In a phonograph, the combination with the diaphragm, of two recording or reproducing points carried thereby and arranged to act on the same side of the blank, said points being arranged at different distances from the center of the diaphragm, whereby the points will form, or trace over, two separate and parallel records, substantially as set forth.

This specification signed and witnessed this 1st day of December, 1890.

THOS. A. EDISON.

Witnesses:

JOHN F. RANDOLPH,
W. PELZER.

(No Model.)

2 Sheets—Sheet 1.

L. W. BRIGGS & D. E. BOSWELL.
PHONOGRAPH.

No. 576,081.

Patented Jan. 26, 1897.

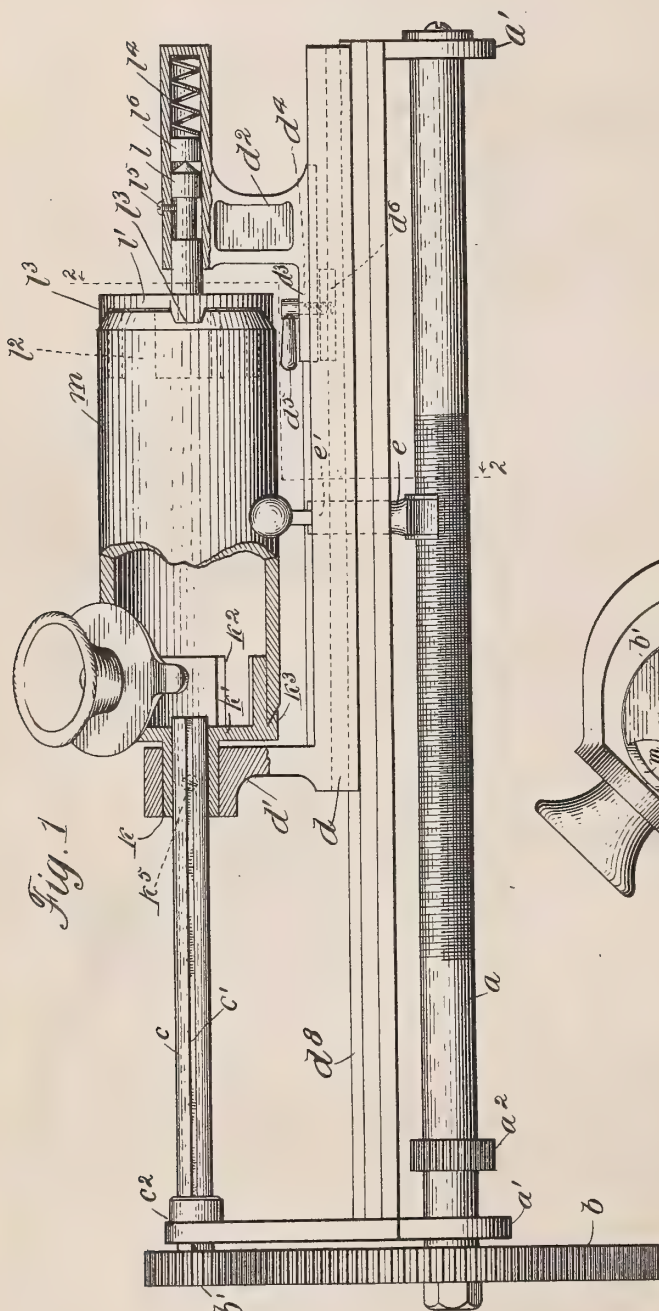


Fig. 1



Fig. 3

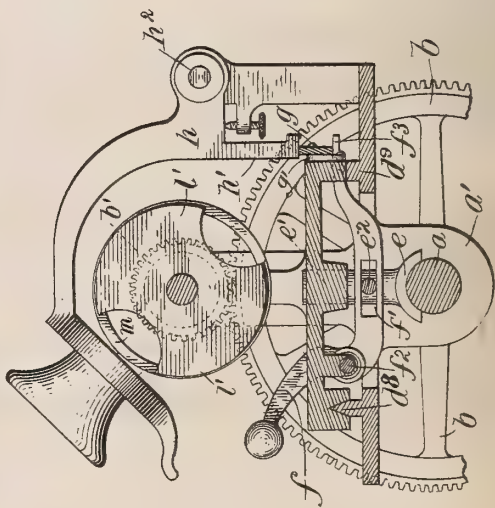
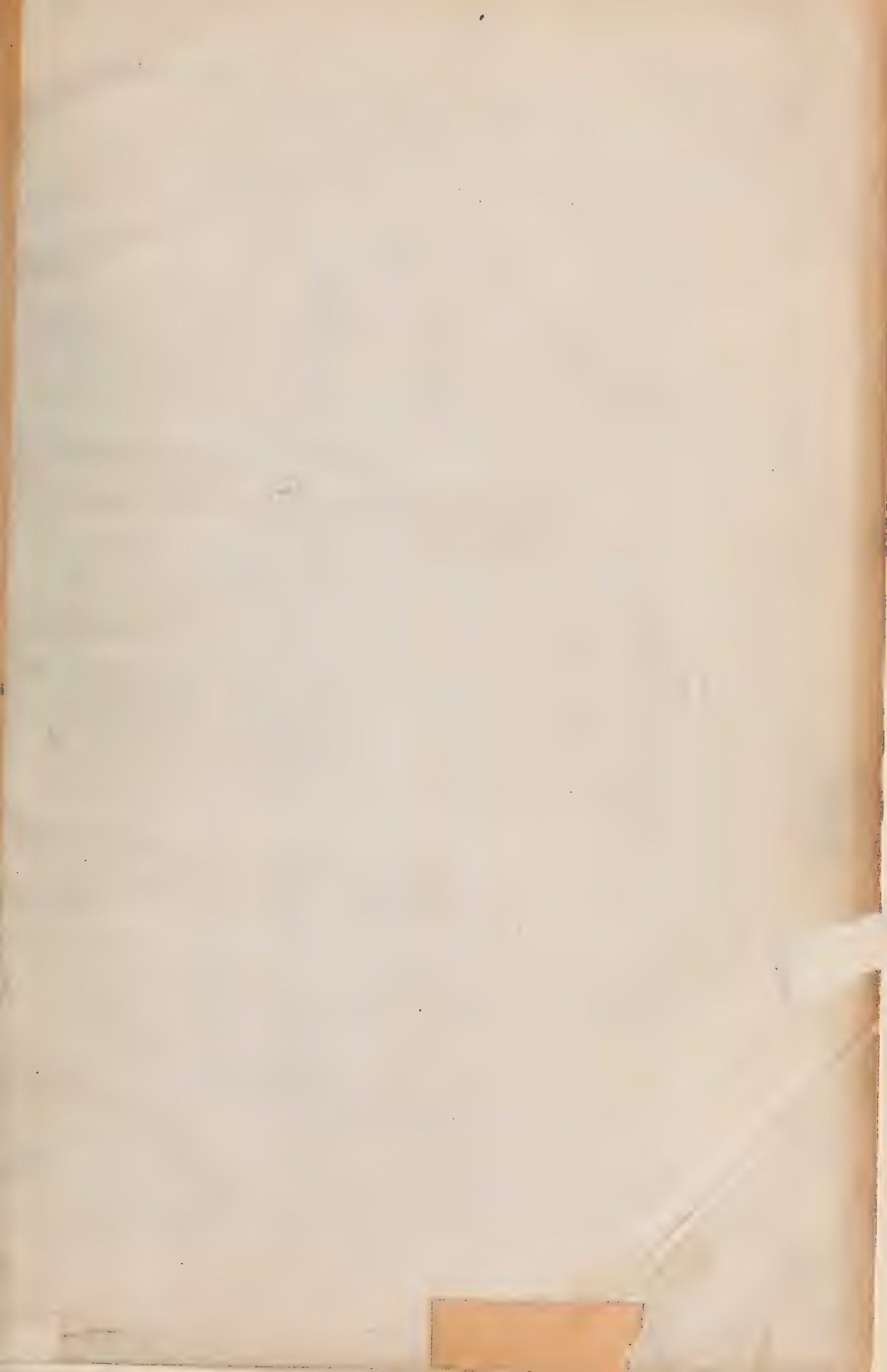


Fig. 2.

Witnesses:
Dr. Hitt C. Tamm.
W. Clyde Jones.

Inventors:
Lewis W. Briggs
Daniel F. Boswell.
By Barton & Brown
Attorneys.



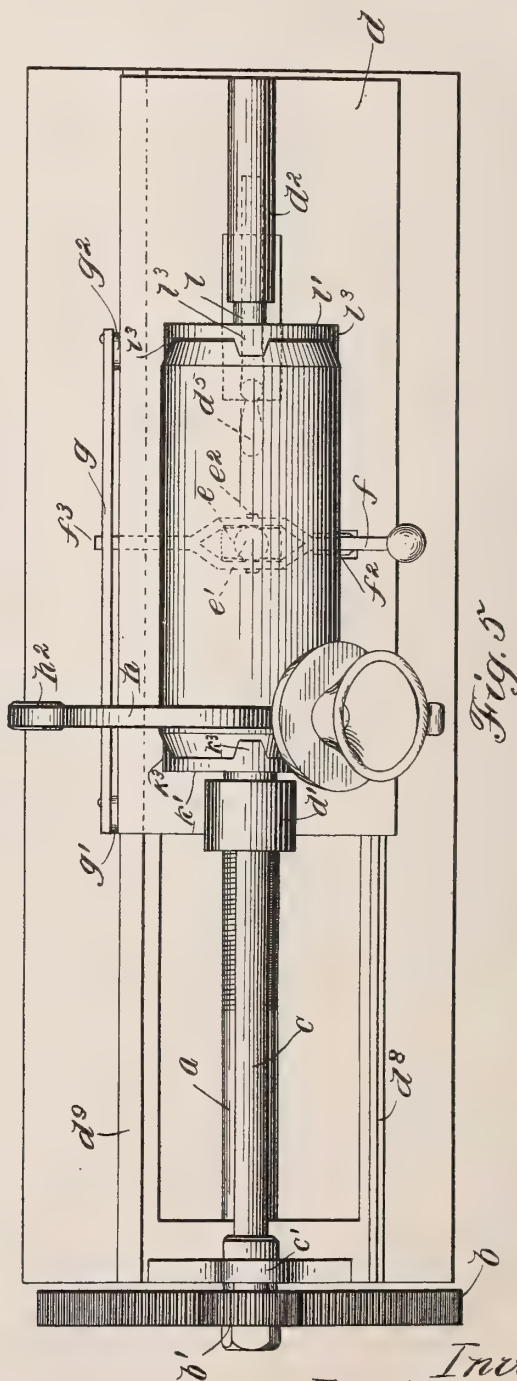
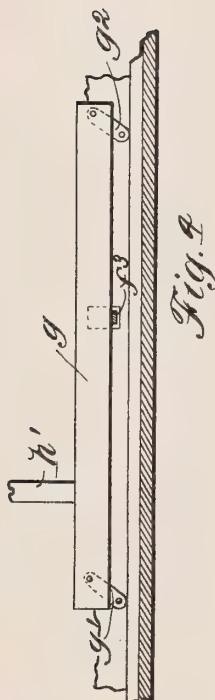
(No Model.)

2 Sheets—Sheet 2.

L. W. BRIGGS & D. E. BOSWELL.
PHONOGRAPH.

No. 576,081.

Patented Jan. 26, 1897.



Witnesses:
De Witt C. Bannett,
W. Clyde Jones.

*Inventors,
Louis W. Briggs
Daniel F. Bozwell,
By Barton & Brown
Attorneys.*

UNITED STATES PATENT OFFICE.

LEWIS W. BRIGGS AND DANIEL E. BOSWELL, OF CHICAGO, ILLINOIS; SAID
BRIGGS ASSIGNOR TO SAID BOSWELL.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 576,081, dated January 26, 1897.

Application filed September 21, 1895. Serial No. 563,177. (No model.)

To all whom it may concern:

Be it known that we, LEWIS W. BRIGGS and DANIEL E. BOSWELL, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Phonographs, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to a phonograph, and more particularly to the mechanism for moving the phonograph-cylinder and the diaphragm relatively, our object being to simplify and cheapen the construction of the mechanism, and, furthermore, to provide a construction wherein the wax cylinder may be more readily placed in position and removed than has been possible in constructions heretofore employed.

A further object is to provide mechanism for releasing the traveling parts from the driving-screw and for raising the phonograph-needle from engagement with the wax cylinder when it is desired to move the parts back to their initial positions after the operation of the phonograph.

In phonographs as usually constructed heretofore the wax cylinder has been mounted to rotate, while the diaphragm carrying the needle adapted to engage the surface of the wax cylinder has been mounted upon a carriage adapted to be moved forward by means of a rotating screw. It is usual to rotate the cylinder one hundred times while the needle is traveling through a distance of an inch along the cylinder, and for this purpose it has been customary to provide a rotating screw having one hundred threads to the inch for imparting the desired movement to the diaphragm-needle.

In the phonograph of our invention the diaphragm-needle is mounted stationarily, while the phonograph-cylinder is adapted to be moved longitudinally, the cylinder being mounted upon a carriage adapted to be advanced by means of a rotating screw. Upon the end of the shaft carrying the screw is provided a gear-wheel which meshes with a pinion carried upon the shaft of the cylinder, the ratio of the gear-wheels as preferably em-

ployed being four to one, whereby the cylinder makes four revolutions to each revolution of the screw. The screw may thus be provided with twenty-five threads to the inch to secure the same results as have been secured with a screw having one hundred threads to the inch, as in constructions heretofore employed; that is, as thus constructed a relative movement of one inch between the cylinder and the diaphragm-needle results while the cylinder is rotating one hundred times. We are thus enabled to greatly cheapen the cost of the phonograph, since the cost of an accurately-threaded screw with one hundred threads to the inch is quite expensive, while a screw with but twenty-five threads to the inch can be made of the necessary accuracy quite cheaply.

The phonograph-cylinder is made hollow and is adapted to be clamped between two face-plates carried upon the traveling carriage, whereby the cylinder may be readily placed in position or removed.

A lever is provided upon the traveling carriage carrying the wax cylinder, which, when rocked, is adapted to disengage the carriage from the driving-screw and to lift the diaphragm-needle out of engagement with the surface of the cylinder, whereby the parts may be moved to their initial positions after the operation of the phonograph.

We have illustrated our invention in connection with the accompanying drawings, in which—

Figure 1 is a view in elevation, partially in section, of the phonograph embodying our invention. Fig. 2 is a sectional view on line 2 of Fig. 1. Fig. 3 is a detail view showing the means for fastening in position one of the adjustable standards carried upon the traveling carriage. Fig. 4 is a detail of the parallel rod-movement employed for raising the arm that carries the needle. Fig. 5 is a plain view of the phonograph.

Like letters refer to like parts in the several figures.

The threaded shaft *a* is mounted to rotate in bearings *a'* *a'*, carried upon the frame of the machine, and a driving-wheel *a²* is mounted upon the screw-shaft *a*, whereby the shaft may be rotated. Upon the end of the shaft

a is mounted a gear-wheel b , meshing with the pinion b' , carried upon the shaft c , journaled at one end in a bearing c^2 , carried upon the frame of the machine, and at the other end journaled in a bearing d' , carried upon the traveling carriage d . The carriage d is mounted upon ways d^8 d^9 , the way d^8 being V-shaped and moving in engagement with the V-shaped groove or channel provided on the carriage, the right line travel of the carriage being thus insured. The way d^9 has a plane surface and is not V-shaped, the necessity of accurately alining the two ways being thus avoided. Upon the carriage d is carried a half-nut e , adapted to engage the shaft a to move the carriage longitudinally as the shaft rotates. The half-nut e is carried upon a shank e' , moving longitudinally within a bearing provided upon the carriage d , whereby the half-nut may be moved out of engagement with the screw-shaft. For this purpose a pin e^2 , carried upon the shank e' , engages a slot f' , provided in the lever f , pivoted at f^2 to the carriage, the rocking of the lever f thus serving to raise the nut e out of engagement with the screw-shaft. The end f^3 of the lever f is adapted to rest beneath a bar g , extending parallel to the carriage and mounted upon links g' g^2 , pivoted to the side of the carriage. When the lever f is rocked and the end f^3 thereof raised, the bar g is engaged and moved upward into engagement with the extension h' , carried upon the arm h , pivoted at h^2 and carrying upon its end the phonograph-diaphragm. The rocking of the lever f thus rocks the arm h upon its pivot and moves the needle carried upon the diaphragm out of engagement with the wax cylinder. The single lever f thus serves to disengage the sliding carriage from the driving-screw and to move the needle out of engagement with the cylinder, whereby the carriage may be returned to its initial position.

Upon the shaft c and rotating within the standard d' is a sleeve k , splined to the shaft c by means of a pin k^5 , engaging the slot c' in the shaft c . The sleeve thus rotates with the shaft, while the sleeve may move longitudinally relatively to the shaft. Upon the sleeve k is carried the face-plate k' , between which and a similar face-plate l' the wax cylinder m is adapted to be held. The face-plate l' is carried upon a plunger l , adapted to move within a bore provided in the standard d^2 carried upon the carriage d . The plunger l is limited in longitudinal movement by pin l^5 . The plunger l has a cone bearing against a piston l^6 , pressed outward by a spring l^4 , to thus impart to the face-plate l' a yielding outward movement to maintain the wax cylinder firmly in position between the two face-plates.

The standard d^2 carries a horizontal extension d^3 , adapted to move in a slot provided in the carriage. A screw d^4 , provided with a handle d^5 , passes through the extension d^3 and engages a threaded hole provided in the block d^6 , which when the handle d^5 is swung

upon its pivot is clamped against the under face of the carriage to lock the standard d^2 in an adjusted position.

The wax cylinder m is made hollow, and its ends rest upon the cylindrical extensions k^2 l^2 of the face-plates, the ends of the cylinder being beveled and adapted to be engaged by the projections k^3 k^3 l^3 l^3 , provided upon the face-plates.

When it is desired to place the cylinder in position, the handle d^5 is swung to unlock the standard d^2 , after which the standard may be moved to the right to permit the placing of the wax cylinder in position between the two face-plates. The standard d^2 may be then moved to the left and clamped in position to thus secure the wax cylinder in position between the face-plates.

The face-plates are preferably cut away at several points, as shown in Fig. 2, to permit the insertion of the finger to grasp the interior of the wax cylinder as the same is being placed in position. As the shaft a rotates the carriage d is moved to the left, the end of the shaft c projecting into the interior of the wax cylinder as the carriage advances.

When, as constructed in practice, the screw is provided with twenty-five threads to the inch, the carriage moves to the left through the distance of an inch while the cylinder is rotating one hundred times, and the same result is thus produced as results from the constructions heretofore employed, wherein a screw having one hundred threads to the inch was employed.

Instead of providing twenty-five threads to the inch it is evident that any other number may be provided, and any preferred ratio between the gear-wheels b and b' may be adopted, but we find the relations above mentioned to give very desirable results.

When the phonograph-cylinder has moved to the left to its extreme position, the lever f may be rocked to release the carriage from the driving-screw and to move the diaphragm-needle out of engagement with the wax cylinder, and the carriage may then be moved by hand back to its initial position.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a phonograph, the combination with a traveling carriage, of ways whereon the said carriage rests permitting the movement thereof only in a plane parallel with the axis of the phonograph, a phonograph-cylinder rotatably mounted upon the said carriage, a non-traveling diaphragm-needle engaging said cylinder, a driving-shaft for rotating the cylinder, a threaded shaft or screw, meshing gear-wheels connecting the said driving-shaft and screw adapted to rotate the latter at a lower rate of speed, a threaded nut or other part carried upon the traveling carriage normally engaging the said screw and imparting to the said carriage a lateral movement directly proportional to the rate of rotation of the said

phonograph-cylinder, substantially as described.

2. In a phonograph, the combination with a traveling carriage, of a hollow phonograph-cylinder mounted thereon, a non-traveling diaphragm-needle engaging said phonograph-cylinder, a driving-shaft for rotating said cylinder having one end journaled in a stationary bearing and the other end movable longitudinally in a bearing carried upon said carriage, the end of said shaft projecting into the interior of said hollow cylinder as the carriage advances, a threaded shaft or screw mounted in stationary bearings, reducing-gears between said driving-shaft and said screw to cause the shaft to rotate at a higher rate than the screw, a nut or part carried upon the carriage and engaging said screw to propel the carriage as the screw rotates, and means for moving the diaphragm-needle out of engagement with the cylinder and for moving the nut out of engagement with the screw; substantially as described.

3. In a phonograph, the combination with a carriage, of a pair of face-plates mounted upon said carriage, a phonograph-cylinder adapted to be held between said plates, a driving-screw for moving said carriage and a driving-shaft splined to one of said face-plates and geared to said driving-screw; substantially as described.

4. In a phonograph, the combination with a traveling carriage, of a pair of face-plates journaled to rotate in standards carried upon said carriage, one of said face-plates being yieldingly pressed toward the other, a phonograph-cylinder adapted to be held between said plates, a rotating screw for driving said carriage, and a driving-shaft geared to said driving-screw and splined to one of said face-plates; substantially as described.

5. In a phonograph, the combination with a traveling carriage, of a pair of face-plates journaled in standards carried upon said carriage, one of said standards being adjustably movable toward and from the other phonograph-cylinder adapted to be held between said plates, a rotating screw for driving said carriage, and a driving-shaft geared to said

screw and splined to one of said face-plates; substantially as described.

6. In a phonograph, the combination with a traveling carriage, of a phonograph-cylinder adapted to be supported thereby, a driving-screw, a nut carried upon the carriage and adapted to engage said driving-screw, a lever adapted when rocked to disengage said nut from said driving-screw, and means operated by the rocking of said lever for raising the diaphragm-needle from engagement with the phonograph-cylinder; substantially as described.

7. In a phonograph, the combination with the carriage *d* of the driving-screw *a*, the nut *e* carried upon said carriage and adapted to engage said screw, pivoted lever *f* connected with said nut *e*, pivoted arm *h* carrying the phonograph-diaphragm, and the bar *g* linked to the carriage and adapted when raised by the end of the pivoted lever *f* to engage and rock the arm *h* to move the diaphragm-needle out of engagement with the phonograph-cylinder; substantially as described.

8. In a phonograph, the combination with the carriage *d*, carrying the standards *d'* *d''* of the surface-plate *l'* mounted in said standard *d''* and having a yielding longitudinal movement therein, said standard *d''* being adjustably movable toward and from the standard *d'*, the face-plate *k'* mounted in the standard *d'*, the shaft *c* splined to said face-plate *k'*, driving-screw *a* and gears *b b'* connecting screw *a* and shaft *c*.

9. In a phonograph, the combination with two face-plates between which the hollow phonograph-cylinder is adapted to be held, of openings in one or both of said face-plates to permit the insertion of the finger to facilitate the placing of the phonograph-cylinder in position; substantially as described.

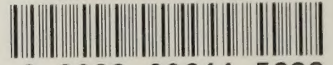
In witness whereof we hereunto subscribe our names this 14th day of September, A. D. 1895.

LEWIS W. BRIGGS.
DANIEL E. BOSWELL.

Witnesses:

GEORGE P. BARTON,
JOHN W. SINCLAIR.

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